Bike Charleston

BIKE & TRAIL MASTER PLAN CHARLESTON, WEST VIRGINIA

Transforming Transportation for a Healthy and Vibrant Future

PREPARED FOR

PREPARED BY

ACKNOWLEDGMENTS

The project team would like to recognize and express appreciation for the myriad of individuals who participated in the development of this Plan. Special thanks to the project advisory committee, Mountain State Wheelers, and Mayor Jones for their contribution to the Plan and for their commitment to making Charleston an active and thriving community.

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TABLE OF CONTENTS

Bicycling is the ideal way to take short trips, reduce congestion and pollution, and save money, all while fostering community engagement and integrating physical activity into daily routines.

Cyclists of all ages and abilities gather at Haddad Riverfront Park to take part in the "Rush Hour Race" - a friendly competition pitting riders against drivers in a timed trip to the State Capitol Complex.

I. INTRODUCTION & VISION

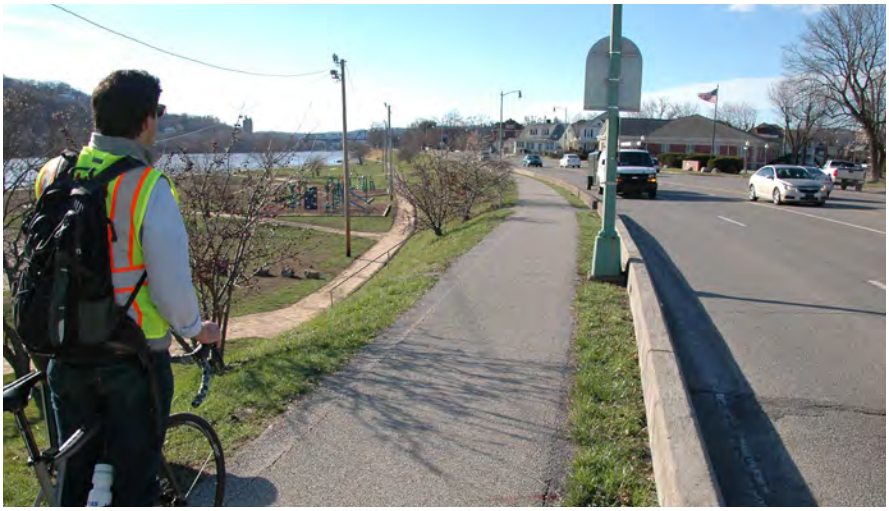
For years we've believed in the need to emphasize walking and running and bicycling over relying so much on cars. Trail development throughout Charleston will make our city healthier and more attractive for people of all ages, especially young people. Charleston already has many places where people can walk or bike to get fit; I hope that today's demonstration shows that getting around Charleston is not limited to cars and trucks, and that the meetings today and tomorrow [surrounding the Bike and Trail Master Plan kickoff] lead to more trails and better health for all of our citizens, and our visitors.

-- Mayor Danny Jones

Introduction

The City of Charleston developed this Bike and Trail Master Plan to propel its overarching goal of becoming **the cultural, recreational, and business capital of the Appalachian Mountains**. The Plan is to be used as a tool for implementing infrastructure improvements to connect all parts of Charleston by safe and comfortable bicycle linkages.

The project team, consisting of City representatives, implementation partners such as the West Virginia Division of Highways, and consultants Alta Planning + Design and TRC Solutions, began the planning process in March of 2015. The project team began the planning process by gathering data and hosting public input meetings in order to familiarize themselves with local factors influencing bicycling conditions. The project team utilized these findings in developing a long-term vision for bicycling in Charleston, and an implementation toolkit to help the City in achieving this vision. **This document summarizes the planning process and findings from this effort, and provides tools for the City and its partners to use in implementing the long-term vision presented herein.**



PLAN ORGANIZATION

SECTION 1 - INTRODUCTION AND VISION

This section sets the tone of the Plan and establishes its overall goals; it answers the questions "Why has Charleston developed a bike and trail master plan?" and "What goals does this plan expect to accomplish?"

SECTION 2 - EXISTING CONDITIONS

Section 2 draws a picture of existing and proposed conditions for bicycling in Charleston as gathered from review of existing planning documents, data analysis, field work, and an extensive public outreach process.

SECTION 3 - NETWORK RECOMMENDATIONS

The network recommendations section presents the long-term vision for bicycling infrastructure throughout Charleston and provides descriptions of the different facility types that should be used to meet this vision.

SECTION 4 - IMPLEMENTATION AND CAPITAL IMPROVEMENT PLAN

The final section of this Plan prioritizes recommended projects based on objective criteria such as need, expected benefit, and cost. It then presents these in a long-term, phased implementation plan to guide the city towards realizing the Plan vision. This section also introduces tools which will help those implementing the Plan identify funding

Project Purpose

Charleston is a city steeped in rich culture, community, and heritage, tucked away in the idyllic Kanawha River Valley deep in the heart of the Appalachian Mountains. At its core, it is a **densely populated, flat city with a well-connected street network** surrounded by endless outdoor recreational opportunities. These characteristics naturally make the City an attractive place for both for recreational bicycling and bicycling for transportation.

However, **Charleston has many barriers to bicycling** such as large roadways with fast-moving traffic, many rivers, railroads, mountains, and highways, and **little formal bike infrastructure** such as dedicated bicycle lanes, separated walking/bicycle paths, and designated bicycle routes. As a result, **only the most hardy and emboldened bicyclists currently feel safe** and comfortable bicycling on a regular basis across Charleston in most places. In order to make Charleston a community where bicycling is a reasonable, safe, and attractive transportation choice for people of all ages and abilities, these barriers must be overcome.

Charleston's residents and visitors, even those who choose not to bicycle, could greatly benefit from the improvements recommended within this Plan. **West Virginia and Kanawha County are some of the lowest-ranking areas in the nation in-terms of public health** (in 2015 West Virginia ranked 44th out of 50 according to the United Health Foundation; Kanawha County ranked 38th out of 55 of West Virginia counties in terms of public health according to the Robert Wood Johnson Foundation). Lower public health leads to higher health care costs and lower workforce productivity, placing this added burden directly on taxpayers. One of the leading contributors to poor public health is adult obesity and physical inactivity. **Creating a better physical environment that encourages walking and bicycling is a key strategy to fighting obesity and inactivity** and has been shown to have substantial impacts with relatively limited public investment (see *Benefits of Bicycle & Trail Investments*).

Mayor Jones kicks off the Charleston Bike and Trail Master Plan planning process in March of 2015 in front of the Kanawha River.

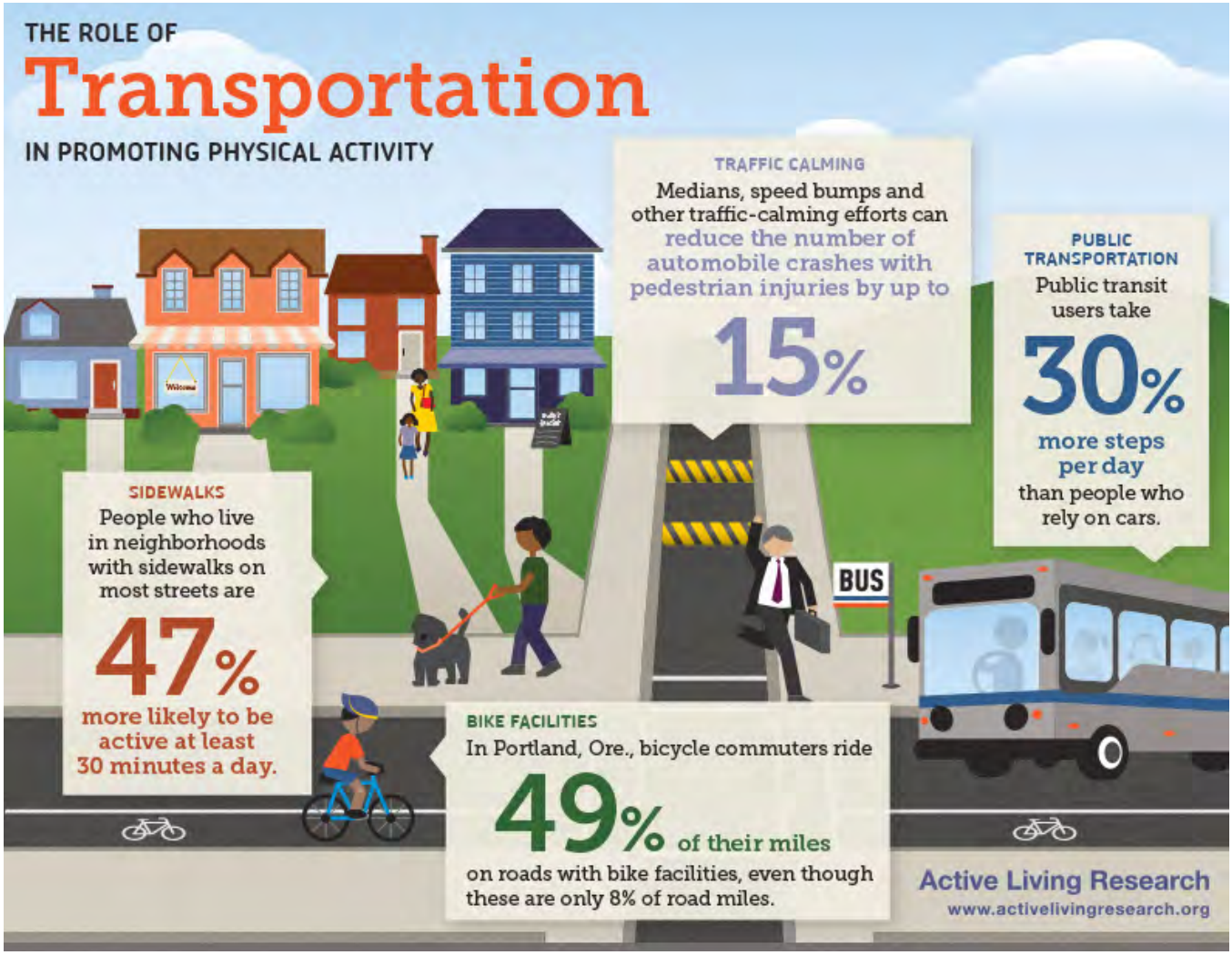
In addition, the City of Charleston has some deeply impoverished areas, as is the case in many other cities throughout the state and nation. Some census block groups in Charleston are characterized by having over 40% of its residents living below the poverty line, and over 30% of households without access to a motor vehicle. **Improving the public realm for walking and bicycling are proven, cost-effective ways to help those with financial difficulties** become financially independent and access essential services, good jobs, and healthy food sources. Providing people the opportunity for financial independence benefits the well-being and prosperity of not only those in need, but the entire community.

Mayor Jones and City Council commissioned this Plan as a tool to help "make our City healthier and more attractive for people of all ages, especially young people." They realize the substantial, positive impact that reduced reliance on personal automobiles would have citywide. To show their dedication to this vision and the ideals represented in this Plan, Mayor Jones and members of City Council have recently moved forward with projects such as the Kanawha Boulevard cycle track and walking path improvements north of Magic Island, added bicycle parking in downtown Charleston, and held events such as the bike ride/car race to the State Capitol that took place surrounding the kickoff of this Plan. **This plan continues to build upon these recent efforts to transform Charleston into a city known for its bicycle-friendliness and as an active, healthy, and prosperous place to live, work, and play.**

At-large city council member Tom Lane (right, on bike) races city manager David Molgaard (not pictured, in car) to the State Capitol grounds following the kickoff event to prove the time-effectiveness of bicycle transportation. Tom Lane won the race.

Benefits of Bicycle and Trail Investments

The *Facts on Active Transportation*, shared on the following page, present some of the acute health, safety and economic issues many cities face today and the ways in which improved active transportation and recreation can have a positive impact on these. In the following section, a summary of the estimated, quantified benefits that would result from increasing walking and bicycling rates and safety in Charleston is presented. These benefits offer a powerful statement regarding Charleston's return on investment for implementing the recommendations in this Plan.



Active transportation can play a major role in building healthier and wealthier communities. The infographic to the left depicts some of the data collected showing just how much of a positive impact it can have.

(Infographic source: Active Living Research)

The Facts on Active Transportation

ECONOMY

ISSUES

- Traffic congestion in 2011 caused Americans in cities to travel an additional 5.5 billion hours, purchase an additional 2.9 billion gallons of fuel, and spend an additional $121 billion in gas. This means, **on average, each car commuter spends roughly 40 hours and over $800 per year waiting in traffic.**

OPPORTUNITIES

- Reducing the number of vehicular lane-miles through road-diets and other methods decreases wear and tear from motor vehicles. Replacing these with pedestrian facilities, bicycling facilities or transit capacity increases transportation capacity with less investment.
- Reducing the dependence on personal motor vehicles decreases personal and family expenditures on autos, potentially saving thousands of dollars per family annually.
- **The cost estimate to own and operate a bicycle is 5-10 cents per mile. The cost estimate to own and drive an automobile is 58.5 cents per mile.**
- Reports have shown that pedestrians and bicyclists spend more, on average, than motorists.
- Trails are the number one amenity potential homeowners cite when they are looking at moving into a community. For example, the Midtown Greenway in Minneapolis and The BeltLine in Old Fourth Ward Atlanta, have spurred development of new housing and businesses to take advantage of the prime locations next to the trail. Both projects brought significant revitalization to the surrounding neighborhoods.
- Bikeways and trails across many regions and cities have been shown to have a major economic impact. For example, following the opening of the Greenville, SC Swamp Rabbit Trail in 2011, **most businesses along the trail saw a 30%-50% increase in sales after the trail opened, and businesses that relocated to the trail observed a 30% to 90% increase in sales.**
- Pedestrian and bicycle infrastructure projects create 8–12 jobs per $1 million of spending. Road infrastructure projects create 7 jobs per $1 million of expenditures.
- Along the Virginia Creeper Trail, visitors spend $1.59 million annually, and generated 27 new jobs.
- Focusing investment in pedestrian and bicycle infrastructure Improvements has proven to be more cost effective than vehicular infrastructure across the board.
- Transportation and safety benefits of increased bicycling include reduced traffic congestion, decreased need for parking, and enhanced safety by providing paved shoulders and wide curbed lanes.

HEALTH

ISSUES

- **"Obesity costs American companies $225.8 billion per year in health-related productivity losses."**
- **"The estimated annual health care costs of obesity-related illness are a staggering $190.2 billion or nearly 21% of annual medical spending in the United States.** Childhood obesity alone is responsible for $14 billion in direct medical costs."

OPPORTUNITIES

- A recent study shows that people who live within 0.6 miles of a pedestrian and bicycle path get 45 minutes more of exercise a week, on average.
- **"A 5% increase in walkability [has been found] to be associated with a per capita 32.1% increase in time spent in physically active travel, a 0.23-point reduction in body mass index, 6.5% fewer vehicle miles traveled, 5.6% fewer grams of oxides of nitrogen (NOx) emitted, and 5.5% fewer grams of volatile organic compounds (VOC) emitted."**
- Multiple studies have shown that 30 minutes of physical exercise - including walking and bicycling - improves mental well-being, lowers blood pressure, the risk of certain cancers, improves self-esteem, reduces tiredness, cardiovascular risk, stress, difficulties with sleep, and increases productivity. All of which lower health costs.
- Cyclists breathe fewer pollutants than motorist despite higher respiration rates.

SAFETY

ISSUES

- Higher traffic speeds result in reduced driver response times and increased severity. **A chance a pedestrian would survive if hit by a car traveling at 20 mph is 95%. This percentage is reduced to 60% at 30 mph, and to 20% at 40 mph.**
- Nationally, there were over 33,500 traffic fatalities reported in 2012. **The Alliance for Bicycling and Walking reports that 14.9% of traffic fatalities are pedestrian or bicyclists, while only 11.4% of all trips are made either walking or bicycling.**

OPPORTUNITIES

- Increasing the number of pedestrians and bicyclists along a corridor, and network-wide, by itself creates a safer environment for these users. Motorists expect the presence of these users and drive more cautiously as a result.
- Complete Streets improvements that reduce crossing distances for pedestrians and bicyclists, highlight conflict zones, create dedicated roadway space for non-motorized users, reinforce safe roadway behavior, increase visual stimulation or a sense of enclosure, and/or actively reduce speeds through geometric roadway changes foster safer speeds and behavior among all roadway users.

Project Vision

The City of Charleston Bike and Trail Master Plan envisions an expanded network of bikeways and trails ***connecting all parts*** *of the community, so that* ***bicycling is a common part of everyday life****, providing multi-modal* ***travel choices****, expanding* ***recreation opportunities****, and* ***strengthening Charleston's image*** *as the* ***cultural, recreational, and business capital of the Appalachian Mountains****. People of all ages and abilities will enjoy access to safe, comfortable, and convenient bicycling routes and benefit from* ***enhanced quality of life*** *and* ***economic opportunity.***

A powerful sentiment painted by local school children posted outside the Charleston planning department.

Goals and Objectives

OVERVIEW

The *Charleston Bike and Trail Master Plan* establishes an overarching, long-term vision for bicycling and trail use in Charleston, along with clear goals and measurable objectives to guide the community in working towards that vision. To that end, the recommendations of this Plan are shaped by these guiding benchmarks and serve as action steps towards achieving those outcomes. The vision, goals, and objectives presented in the following section are based on:

- Input from the Project Advisory Committee and City of Charleston Staff
- Stakeholder focus groups and broad public outreach
- Existing vision and goal statements of prior city and regional planning efforts
- Nationally-recognized performance measures for bicycle and trail planning.

GOALS AND OBJECTIVES

This Plan uses local input, as well as characteristics of typical Silver-level Bicycle Friendly Communities, to establish objectives, goals, and benchmarks for the City as it moves forward with advancing bicycling and trails. Specific objectives and goals of this plan are listed on the following page.

Left: Photosimulations of Capitol Street (top) and Virginia Street (bottom) showcase recommended bicycle and pedestrian improvements.

GOAL 01

Create a community network of on- and off-street bikeways and trails designed for all ages, abilities, and user groups.

- Complete this plan's top five priority bikeway and trail projects by 2020.
- Achieve a total bikeway network mileage that equates to 30% of the total roadway network mileage by 2020.
- Incorporate intersection safety and accessibility improvements for pedestrians and bicyclists within all corridor improvement projects.
- Develop on-street and off-street bikeway facilities to meet national best practices in design, providing a safe and inviting environment for all ages and ability levels.
- Consider geography and socioeconomic equity when prioritizing bikeway and trail infrastructure investments.

GOAL 02

Capitalize on existing amenities and utilize bicycling as a tool for targeted community growth.

- Complete this plan's top five priority bikeway and trail projects by 2020.
- Prioritize continued investment in and expansion of the Kanawha Trestle Trail as a signature, catalyst project.
- Prioritize bikeways that link residents and visitors to the Kanawha Trestle Trail and Kanawha City Bicycle Route.
- Collaborate with county, regional, and state partners to create bikeway connections to Kanawha State Forest, state bicycle touring routes, and similar recreational and tourism amenities.
- Incorporate bike- and trail-supportive policies and regulations to ensure that new development supports the transportation, health, and quality of life goals of the community.

*The goals presented herein are also intended to **affirm the goals established in Imagine Charleston** - the City's 2013 comprehensive plan adopted in 2013. Those goals are:*

- *Perfect and perpetuate strong and sustainable neighborhoods*
- *Conduct efficient and collaborative government*
- *Produce and facilitate events and recreational opportunities*
- *Develop and maintain sound and adequate infrastructure*
- *Foster and support business development and attraction*

GOAL 03

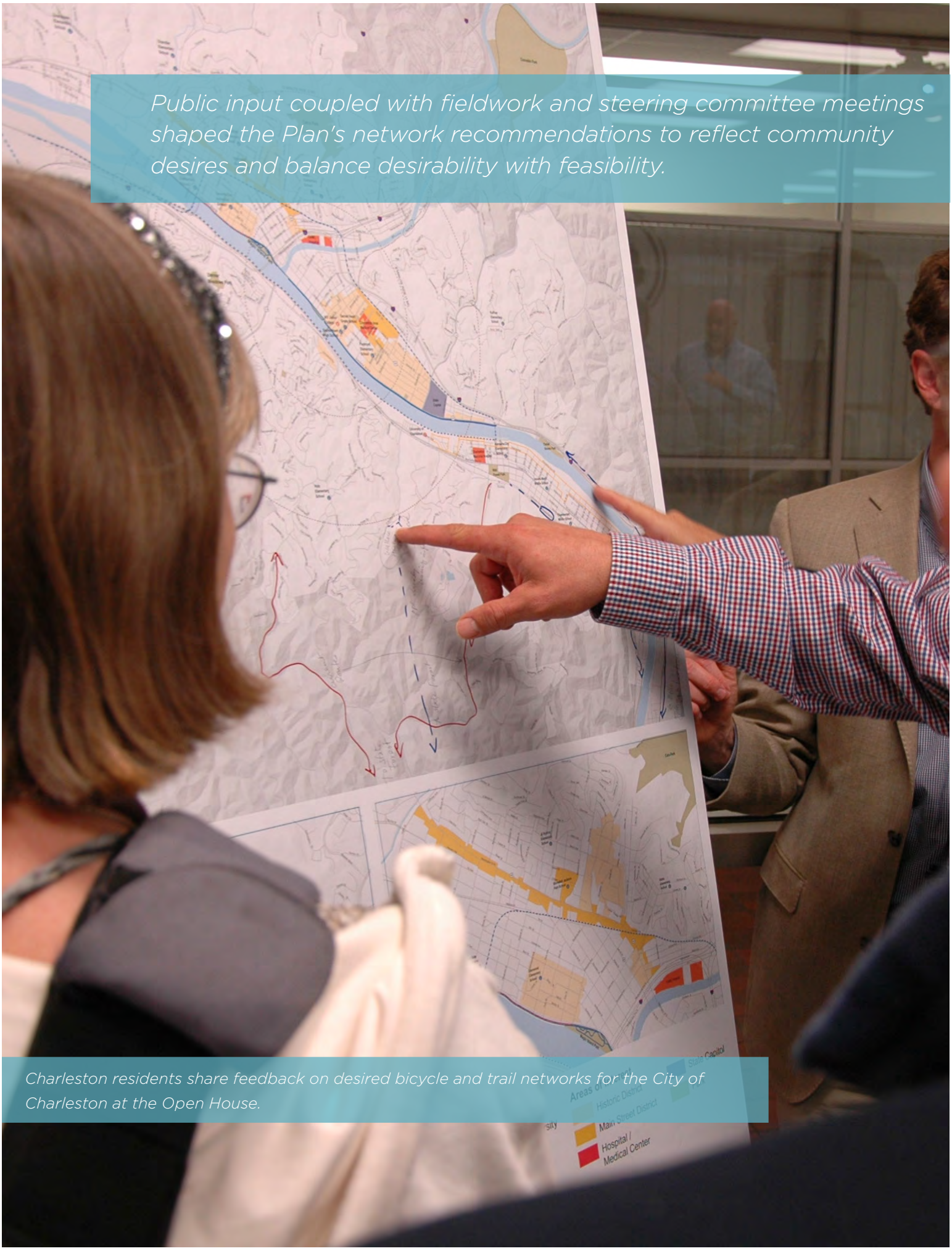
Complement engineering investments for bicycling with encouragement, education, enforcement, and evaluation programs.

- Solidify institutional, nonprofit, and community partnerships for developing encouragement and educational programs that will positively impact bicycling activity.
- Promote investments in the bikeway and trail network as part of Charleston's image as an outdoor-recreation destination.
- Leverage investments in bicycling infrastructure by developing a city-wide bicycle and trail wayfinding signage system and route maps.
- Utilize targeted enforcement to discourage unsafe behaviors of motorists, Licensed Commercial Drivers, bicyclists, and pedestrians.
- Ensure that education and encouragement programs for biking and trail use reach all socioeconomic groups, geographic locations, genders, races, and walks of life.

GOAL 04

Institutionalize bicycle-friendliness both transportation and recreation as a core value of City projects, policies, and programs.

- Work across jurisdictions, departments, and organizations to achieve coordination on short-, medium-, and long-term transportation and infrastructure goals and plans.
- Establish dedicated funding amounts and fundraising goals for implementation of the Plan.
- Designate a staff member and/or establish a new staff position dedicating at least 50% of time to implementation of the Plan
- Coordinate annual pedestrian and bicycle counts with planned infrastructure investments to measure impacts.
- Update design guidelines to meet current best practices of ADA-accessibility and safe and innovative bicycle and trail facilities.
- Achieve Bronze-level status as a Bicycle Friendly Community, designated by the League of American Bicyclists, by 2020 and Silver-level by 2022.



Public input coupled with fieldwork and steering committee meetings shaped the Plan's network recommendations to reflect community desires and balance desirability with feasibility.

Charleston residents share feedback on desired bicycle and trail networks for the City of Charleston at the Open House.

II. EXISTING CONDITIONS

Transportation is about more than asphalt, concrete, and steel. Ultimately it is about providing people with the opportunity for a safer, happier, and more fulfilling life.

-- Rodney Slater, Former US Secretary of Transportation

Introduction

This chapter provides an overview of the major components of the City of Charleston's existing environment for bicycling and trail usage. **This includes an assessment of the primary opportunities and constraints that exist for development of a safe and connected bicycle and trail network.** The assessment is based on the project team's review of existing plans, field observations, and GIS-based mapping analysis, as well as insights gained from the public and key stakeholders.

From March 17th to 19th, the project team led a multi-day field visit during the first phase of the Charleston WV Bike and Trail Master Plan planning process. The visit included a charrette-style public involvement process, a kick-off meeting of the Project Advisory Committee, stakeholder meetings, and field work for the consultant team. This following sections describe the information gained and critical outcomes of that process. This chapter includes:

- Key Findings and Project Themes
- Results of Data Collection
- Analysis of Opportunities and Constraints
- Review of Existing Plans
- Community-Identified Needs

Key Findings and Project Themes

Based on the evaluation of Charleston's safety, infrastructure, and user needs as described in the following sections, the project team developed the following key themes and Plan priorities:

LEVERAGE THE CITY'S OUTDOOR RECREATION BRAND WITH NEW BIKE AND TRAIL INVESTMENTS

Charleston is already working to create a brand that builds upon the city's and the region's natural resources and growing image as an outdoors/recreation-oriented community. Bicycling and trail infrastructure can directly support this effort.

CREATE A BIKEABLE STREET NETWORK

The West Side, Downtown, East End districts of Charleston, as well as part of Kanawha City, offer a substantial, well-connected street grid. This provides an important basis for a seamless and convenient bike network. A number of one-way corridors with modest traffic volumes present an opportunity for making space for bicyclists.

COMPLETE A CATALYST PROJECT

The Kanawha Boulevard project, which is currently underway, will be a very important catalyst project for the city. It will change how people experience the city on bike and on foot and increase demand for similar facilities and for infrastructure that safely connects to the Kanawha River.

IMPROVE CYCLING SAFETY

Riding a bicycle on a sidewalk is a relatively common (and generally unsafe) activity in Charleston's city center. Making safer spaces for bicyclists on the roads can reduce the incidence of sidewalk-bicycle-riding and create safer conditions for all users.

IMPROVE BIKEABILITY OF BRIDGES

Charleston's rivers and existing bridges present a significant barrier to bicycling activity. With proper improvements to the existing bridge crossings, Charleston has an enormous opportunity to leverage its overall biking network and better connect City residents and visitors.

CONSIDER BROADER IMPACTS OF CYCLING

There is strong interest in investing in bicycling and trail infrastructure as a community development tool (targeting under-served areas), as a means of promoting health & wellness, and as an economic development tool (better connecting people to commercial and retail destinations and increasing quality of life and tourism opportunities).

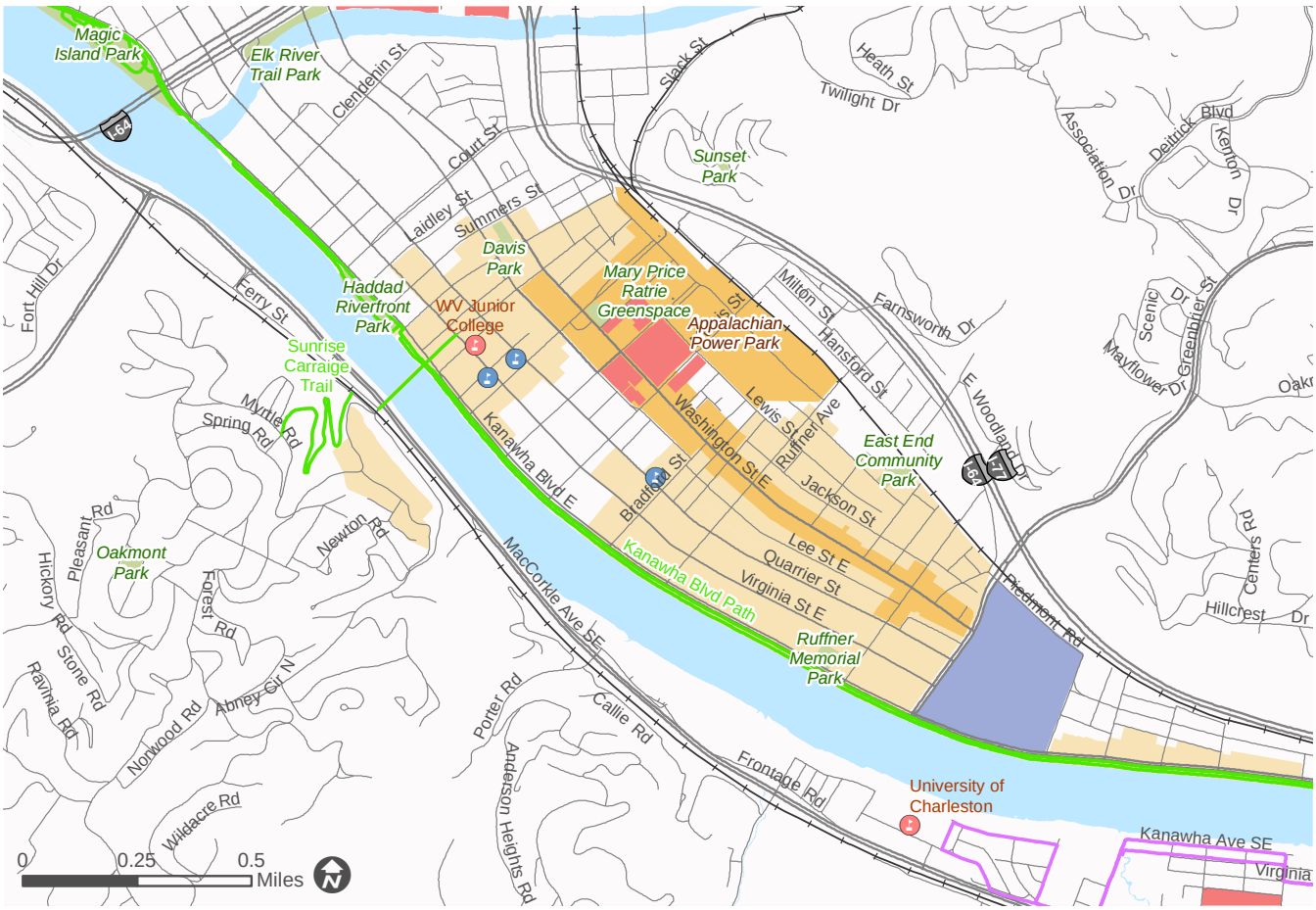
Data Collection and Base Map

A first step in evaluating the existing conditions of the City of Charleston, is the development of a comprehensive base map. Based on GIS data provided by the City and its partners, the project team created a map illustrating existing and previously proposed bikeways, trails, and greenways, as well as supporting information (such as the regional transit system, rail corridors, parks, bodies of water, etc). The project base map is shown on the following page. The table below summarizes existing bicycle facilities in the City.

Table 2.1 Existing Bikeway Facilities

Facility Type	Miles
Total City Roadways	438.6
Bicycle Route	8.9
Shared-Use Path	11.6
Total Mileage	21.4
Bicycle Parking	**Total**
Bicycle Racks	46

Zoom Map of Existing Conditions in Downtown Charleston (see map on right page for legend descriptions)



Charleston, WV
Bike & Trail Master Plan

Base Map
Existing Conditions

Existing Bike Facilities

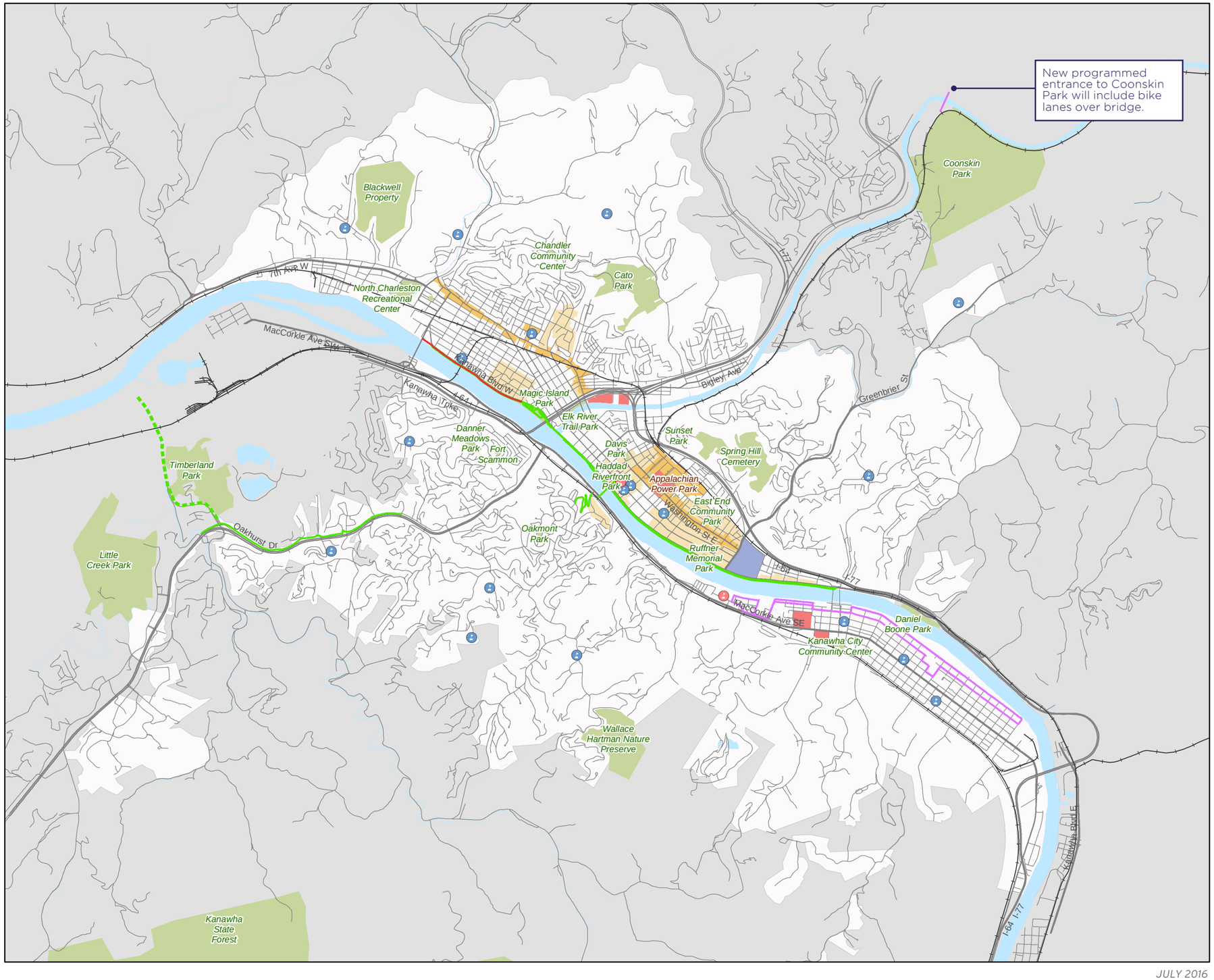
- Bike Route
- Shared-Use Path
- Previously Proposed Path
- Bikeways Under Development

Schools

- College / University
- Primary School

Areas of Interest

- Park
- Historic District
- Main Street District
- City Boundary
- State Capitol
- Hospital / Med. Center



0 0.5 1 Miles

Fold Out for 11x17 Map

Opportunities and Constraints

OVERVIEW

The City of Charleston has the foundation to become a renowned bicycle and trail-friendly city. **The relatively mild climate year-round, natural amenities such as the Kanawha River, the concentration of commercial and workplace locations, the passion residents have for the outdoors, and the well-connected street grid in the downtown areas are all characteristics that will push Charleston forward on its bicycling and trail goals.**

However, as indicated during the public outreach, fieldwork, and feedback from the steering committee, bicycling in Charleston is not without challenges. There are many significant safety concerns, physical barriers, and gaps in network connectivity that must be addressed in order to reach the goals identified for this Plan. The following sections discuss the current bicycle and trail network, the many opportunities that exist as starting points for improvement, and the constraints that the city must address to become a more bicycle and trail-friendly city.

OPPORTUNITIES

While the city currently lacks a variety of on-road bicycle facilities and trail connections, there are numerous assets and opportunities throughout Charleston that provide a strong base for a facilitating a safe, accessible, and convenient bicycle network.

Transportation in downtown Charleston is largely facilitated via a compact grid network with corridors that promote relatively low speeds with varying volumes of traffic. This area has a strong concentration of attractions, amenities, and employment, which creates a favorable environment for short bicycle commutes, cross-town trips, and easy access to employment centers. Kanawha City and the West Side are also composed of a favorable grid pattern. This grid pattern creates a predictable, option-rich environment where bicyclists can easily navigate and select routes that best suit their travel purpose or level of comfort. There are a high number of low-volume local streets in these areas that presently function as bicycle boulevards or neighborhood greenways. These low-stress streets

Overcoming barriers to connectivity, such as the Kanawha River, are crucial to the success of the Plan.

Low-volume streets have unrealized potential as bicycle boulevards.

encourage bicycling trips and have enormous potential to be developed into strong components of the bicycle network.

The Kanawha River and the multi-use paths along its north shore are another strong attraction that facilitates recreation and transportation around the city. The segment from the Patrick Street Bridge to Magic Island Park is currently in the process of being converted into a two-way cycle track. This segment, and future segments as they are implemented, will become an even larger attraction and develop into a key bicycle connection for the city.

Key opportunities of the existing bicycle system and roadway network include:

- Much of the City, especially around the downtown core, offers good **street connectivity** which provides alternate routes for bicyclists wanting to travel off of heavily trafficked streets.
- Some of the roadways in Charleston have **more roadway capacity than their traffic volumes warrant**. Excess roadway provides an opportunity to reallocate the space for bicycle facilities or treatments to improve safety. For example, road diets can be implemented to add space for on-street parking, landscaping, pedestrian crossing improvements, and/or bike facilities.
- There are many **bike route options** that provide good east-west and north-south connectivity.
- **Parallel neighborhood streets** with lower traffic volumes (like Noyes Avenue) offer good routes for bicycling off of streets with higher traffic volumes and speeds (like MacCorkle Avenue).
- The city has begun to make **on and off-street bicycling improvements in recent years**, including Oakhurst Road, Kanawha Avenue SE, Virginia Avenue SE, and along Kanawha Boulevard.
- The **relatively flat terrain** in the downtown, Kanawha City, and North Charleston areas provide more comfortable riding across large sections of the city.

CONSTRAINTS

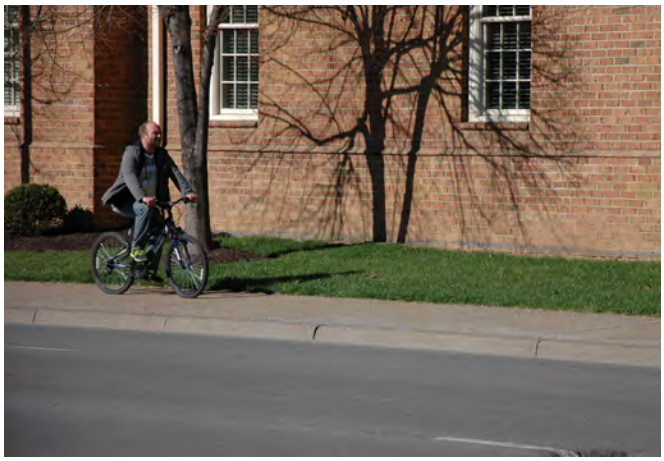
Charleston also has several physical barriers currently discouraging bicycling and trail use. Many local roadways have excessive roadway capacity and were generally designed for automobile use only. Traveling in the city often requires crossing intersections and bridges with complex and intimidating traffic patterns. Navigating these barriers is difficult and they act as major detractors to promoting bicycling in the region.

Additionally, much of the city has considerable topographic challenges. The mountainous geography has resulted in sprawled, low density land use, narrow corridors, and a disjointed roadway network with abrupt turns and high grade changes outside of the city core and Kanawha River flood plain.

Key constraints of the existing bicycle system and roadway network include:

- **As one moves away from the City center, street network connectivity and development density decreases.** This makes bicycling more difficult as prospective riders are typically forced onto major roadways and must travel longer distances to reach their destinations. Strategic improvements in street network connectivity and policy affecting new development can help to improve this.

- **Connectivity across the Kanawha River and Elk River is limited** due to a lack of separated bicycle facilities across many of the bridges.
- **Separated bike facilities, such as bike lanes or off-street paths are limited.** These are important as they create a more comfortable environment for bicyclists of multiple ages and abilities.
- **Surface condition and debris** on some roadways, like the shoulders on MacCorkle Ave, make it difficult for bicyclists as they are more susceptible to poor maintenance conditions.
- **End-of-trip bicycle facilities, such as short and long-term bicycle parking, are limited throughout Charleston.**
- Many bicyclists choose to ride on the sidewalk to avoid sharing the road with cars throughout much of Charleston. In the more mountainous portions of Charleston, there is a **lack of shoulder space or signage to direct bicyclists.**
- **Highways and other major roads with high posted speeds and traffic volumes** are especially uncomfortable for bicyclists. Roads such as MacCorkle Avenue, Highway 119, Washington Street, and Greenbrier Street have many driveway cuts and a lack of dedicated bicycle facilities that make it impractical and uncomfortable to bike these corridors. These barriers restrict bicyclists' access to the many shopping centers, services, and attractions that are located along these roads.
- **Bikeway connectivity to transit and secure bike parking at transit stations are limited.**
- **Transportation routes are restricted** in Charleston due to the Kanawha River and the Elk River. Current bridges lack bicycle facilities, requiring bicyclists to share the lane with vehicular traffic or dismount and use the narrow pedestrian sidewalk when it is available.



Fast-moving traffic and a lack of shoulder space force this cyclist to ride on the sidewalk.

Major roadways lack bicycle facilities and are uncomfortable and unsafe for bicyclists.

EXISTING CONDITIONS PHOTO INVENTORY

The multi-use path along Kanawha Boulevard is a popular recreation and transportation destination for pedestrians and bicyclists. **The planned two-way cycle track upgrade will greatly improve resident's access to the Kanawha River and better facilitate travel along an important corridor.** The separated facilities will also reduce potential conflicts between bicyclists and pedestrians.

Bicycle parking is offered in very few locations throughout Charleston. Offering secured short- and long-term parking particularly in commercial and employment locations as shown above, makes bicycling safer and more convenient. This commitment by the community shows support and encourages the use of bicycling as a form of transportation.

Many roadways in Charleston have excess capacity, such as segments of Virginia Street. Reorganizing the roadway would provide enough room to implement a physically separated cycle track along this corridor.

With minor improvements, **low-volume neighborhood streets such as Noyes Avenue can offer an ideal environment for bicycling and serve as an alternative route** for bicyclists wishing to avoid traveling along MacCorkle Avenue.

Many bicyclists choose to ride on the sidewalk to avoid sharing the road with cars. Implementing separate bike facilities throughout the city will encourage bicyclists to ride on the road and avoid potential conflicts with pedestrians.

Conflicts between bicyclists and pedestrians are common on the 35th Street Bridge due to the narrow sidewalk. Widening the protected sidewalk if possible and encouraging dismounting zones are potential solutions to better accommodate all modes.

The existing right-of-way along the freight railroad through town provides an **opportunity to develop a rails-with-trail connection through a large portion of Charleston**. The trail could potentially run from the state capitol grounds to North Charleston, connecting to the proposed rehabilitation of the Trestle Bridge.

Many intersections in Charleston are complex and intimidating to navigate via a bicycle. Intersection treatments such as lane striping, bicycle loop detectors, and bicycle boxes will be cost-effective solutions to improving the awareness and safety of bicyclists at intersections.

Many of Charleston's busiest retail, employment, and recreation centers are difficult to access by bike due to them being along high-traffic, high-speed roadways. Corridors such as MacCorkle Avenue have tremendous potential to generate bicycle traffic, but there are currently **too many barriers to encourage bicycle usage**.

Charleston has a substantial number of residents who bike for recreation, including long rides and mountain biking. The **Kanawha State Forest offers scenic views and world-class mountain biking trails** throughout the park. Improving bicycle connectivity to this area would improve safety and access for these users, strengthening the **connection between Charleston and nearby natural amenities.**

Charleston has a high existing demand for bicycling and trail use due to the dense concentration of downtown amenities and employment centers. The relatively mild climate and flat terrain in many areas also make the environment very amenable to bicycling. An abundance of wide roadways with relatively low traffic volumes in Charleston can easily be retrofitted to include bicycle connections.

Summary of Plan Review

OVERVIEW

Appendix A provides a summary of bicycle and trail planning-related efforts in Charleston, West Virginia and surrounding communities that have connecting routes into Charleston. The ten plans reviewed for this Plan are listed in *Table 2.2*. Common ethos emerged across the ten different plans. Such themes centered around Charleston's need for an improved quality of life as it relates to transportation and recreation. In achieving this vision, each plan touches on a series of recommendations:

- Provide a walking and bicycling network,
- Provide a well-maintained trail system,
- Promote access to alternative transportation,
- Enhance recreational opportunities along the riverfront,
- Adopt a Complete Streets policy, and
- Improve land use and urban form to promote walkability and a mix of uses.

Each plan is described in more detail in Appendix A.

Table 2.2 The plan review included an assessment of relevant bicycle-trail planning documents.

Plan	Agency	Year
East End Community Renewal Plan	City of Charleston Planning Department & Charleston Urban Renewal Authority (CURA)	2005; amended 2012
Charleston Riverfront Master Plan	City of Charleston, WV	2006
Greater Charleston Greenway Initiative	West Virginia Land Trust	2006
West Side Community Renewal Plan	City of Charleston Planning Department & Charleston Urban Renewal Authority (CURA)	2008; amended 2014
Bicycle and Pedestrian Plan for Kanawha and Putnam Counties	Regional intergovernmental council	2008
Master Plan for Pedestrian and Bicycle Trail Corridors	City of South Charleston, WV	2011
Imagine Charleston - Comprehensive Plan	City of Charleston, WV	2013
Imagine Charleston - Downtown Redevelopment Plan	City of Charleston, WV	2013
Kanawha City Corridor Study	City of Charleston, WV	2013
Kanawha Trestle and Rail Trail Master Plan	City of Charleston, WV	2013

Community Identified Needs

OVERVIEW

The public outreach process included five major components:

- Stakeholder Meetings
- Public Open House
- Project Website: www.CharlestonBikeandTrail.com
- Interactive Online Map (part of project website)
- Citizen Comment Form (online and hard copy)

The results of each forum for public input are described in the following sections. The major themes and community priorities identified through these outreach processes are reflected in the aforementioned summary of Key Findings section within this chapter.

QUESTION 6

What is the likelihood that the following types of bicycling facilities would influence you to bike more often?

	Very Likely	Likely	Unlikely	Very Unlikely
Directional and wayfinding signage for bicyclists	☐	☐	☐	☐
Bicycle boulevard (shared, low-speed streets)	☐	☐	☐	☐
Striped bike lanes	☐	☐	☐	☐
Buffered bike lanes	☐	☐	☐	☐
Protected cycle tracks (bike lanes physically separated by curb or parking)	☐	☐	☐	☐
Intersection improvements for bicyclists	☐	☐	☐	☐
Off-street paths	☐	☐	☐	☐

PAGE 2/4

Above left: Snapshot of the public input form used to obtain information on existing conditions in Charleston at the onset of the Plan.

Above right: Flyer for the public input meeting held by the project team in March 2015 to collect input.

STAKEHOLDER MEETINGS AND PUBLIC OPEN HOUSE

The project team hosted a total of **seven stakeholder meetings**. An existing informal coalition of organizations and individuals interested in bicycling and trails served as a project advisory committee, providing detailed input and feedback on plan components. Additional stakeholder groups were organized based on broad areas of interest or perspective, such as local and regional staff, economic development and tourism, transportation agencies, neighborhood representatives, and elected or appointed community leaders. These groups included:

- City of Charleston and Regional Intergovernmental Council Staff
- City Council and City Commission Members
- West Virginia Department of Highways and Federal Highway Administration Staff
- Charleston Area Alliance, CVB, Generation Charleston, and related economic development groups
- Neighborhood and community group leaders
- Bicycle shops and bicycling clubs

A public open house took place in conjunction with and following the stakeholder meetings. In total, **the stakeholder meetings and open house attracted over 100 participants, as well as media coverage from four local news outlets.**

Above: Residents share ideas with the project team at the focus group and public meetings.

PUBLIC INPUT THEMES

While the project team received a broad range of comments and suggestions, clear themes emerged related to the overarching vision for a more bicycle- and trail-friendly Charleston and the key opportunities and constraints relevant to achieving that vision. The comments from citizens and stakeholders are organized into general categories below:

BICYCLE AND TRAIL USER NEEDS

- Stakeholders valued the idea of bicycling for transportation (biking to a destination)
- Strong interest in safe bicycling for families (all ages and abilities)
- The existing River Trail is not a safe or comfortable facility for many ages/abilities
- Sidewalk-bicycle-riding is a relatively common (and generally unsafe) activity in downtown
- In addition to bicycling infrastructure, motorist education is needed for sharing the road
- More signage (and maps) related to bicycling safety and bicycling routes is needed

STREET NETWORK AND EXISTING FACILITIES

- There is a well-connected street grid in the West Side/Downtown/East End of Charleston, as well as parts of Kanawha City; this provides an important basis for a seamless bike network
- A number of one-way street corridors with modest traffic volumes present an opportunity for making space for bicyclists
- On-street parking downtown is important, particularly for weekend visitors to downtown and for potential new tenants
- Better maintenance of existing trails is needed

BARRIERS AND CONSTRAINTS

- Narrowness of roads
- Topography outside of the river valleys
- Crossing Kanawha River and Elk River
    - Currently, 35th Street over the Kanawha River provides the best crossing environment for bicyclists, but it offers little more than a sidewalk and does not provide adequate space for both pedestrians and bicyclists. The bridge carries significant pedestrian traffic
    - Rails on existing bridges are not sufficient – it feels as though a bicyclist is riding higher than the rail height in some cases
    - Crossing the Elk River where the Kanawha Blvd ends/begins is difficult
    - Patrick Street Bridge needs improvement
- MacCorkle Avenue is a major barrier both in terms of safety along the corridor itself, but also in terms of crossing, even at signalized intersections
- Kanawha Boulevard is also difficult to cross

KEY DESTINATIONS AND TARGET AREAS

- Bridge Road Neighborhood Association needs improved bicyclist access to neighborhood shopping district (on Bridge Road)
- Connect the Bridge Road shopping district with Carriage Trail
- East End Main Street is an important district/ attraction
- Ashton Place on Corridor G (at Krogers) is difficult to access
- Piedmont Road provides a bicycle route connection between the East End and Westside

PARTNERS AND FUNDERS

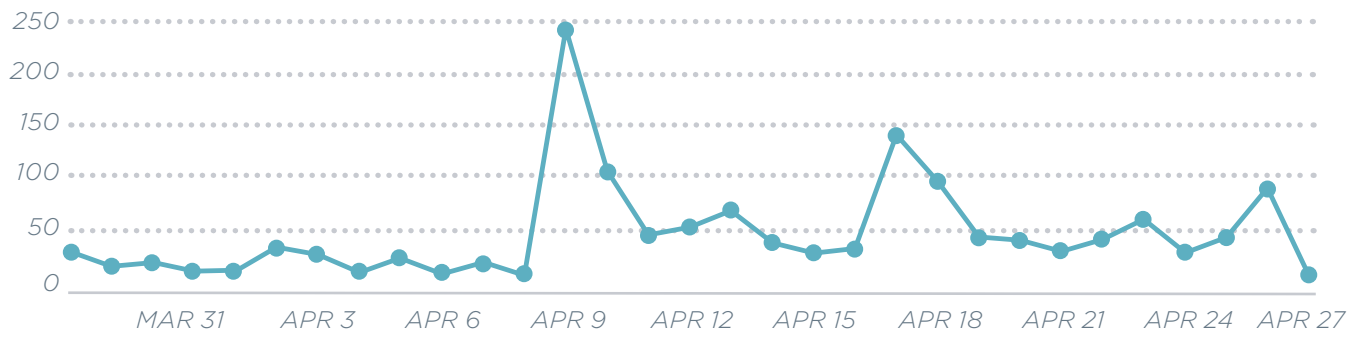
- Greater Kanawha Valley Foundation highly values partnerships in grant requests
- Huge opportunity to build on Charleston's natural resources and growing image as an outdoors/recreation-oriented community
- Potential to better capitalize on the Midland Trail and heritage corridor
- Charleston is an emerging art destination (e.g. FestivALL and downtown art bicycle racks)
- Recent increase in sports events including SportsFEST and the Capital City Challenge Triathlon

PROJECT WEBSITE

The project website was an important tool for sharing information about the *Charleston WV Bike and Trail Master Plan* and providing a consistent source for project updates to the general public. The website received **over 1,500 page views and over 650 unique visitors** in the period from March 17th through the end of April. The daily variation in page views to the website is illustrated in the graph below. During the same period, the website received 17 comments from interested citizens.

The project website experienced 1,500 page views from mid-March to the end of April.

PROJECT WEBSITE PAGE VIEWS



CITIZEN COMMENT FORM

A citizen survey to gather information related to the Charleston Bike and Trail Master Plan was available from March 13, 2015 through April 13, 2015. Charleston residents submitted a total of 247 completed surveys. A summary of the results are discussed below.

RESPONDENT CHARACTERISTICS

Of the 247 survey respondents

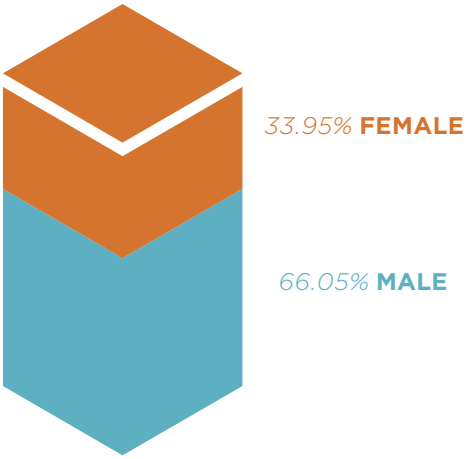
- 2/3 identify as male
- 1/3 identify as female
- 2/3 live in the city
- 3/4 work in the city

The age group of 40-65 respondents made up the largest percentage of survey takers at 54 percent. Twenty six percent of respondents were between the ages of 30 and 40 and 12 percent were between the ages of 18 and 30. Only 8 percent of survey takers were over the age of 65. Compared to the 2010 U.S. Census breakdown of ages in Charleston, this represents an over representation of residents aged 30 to 65 and an under representation of residents over the age of 65.

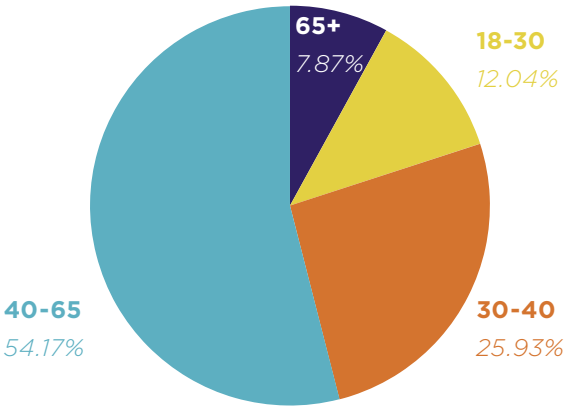
BICYCLE AND TRAIL BEHAVIOR, USAGE, AND PREFERENCES

The survey found that **86 percent of the 246 respondents consider the creation of a safe and connected bicycle and trail network in Charleston to be highly important.** In addition, an overwhelming 95 percent of respondents would bicycle more if they were closer to trails or on-street bicycle facilities or if there are more of them.

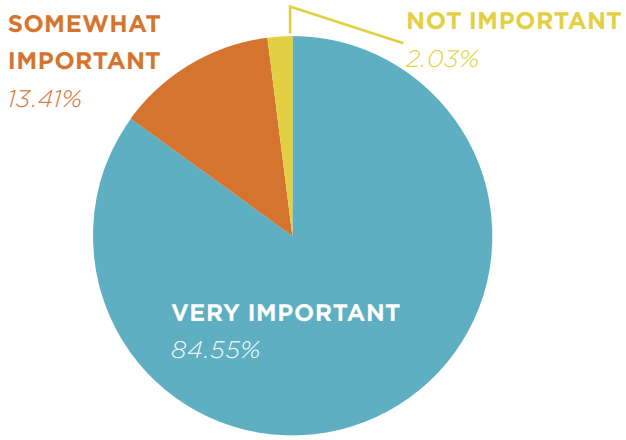
GENDER OF SURVEY RESPONDENTS



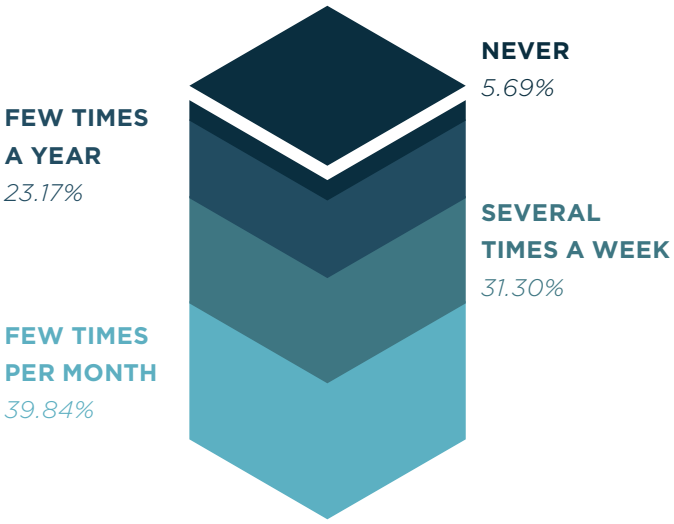
AGE OF SURVEY RESPONDENTS



IMPORTANCE OF A CONNECTED BICYCLE AND TRAIL NETWORK IN CHARLESTON



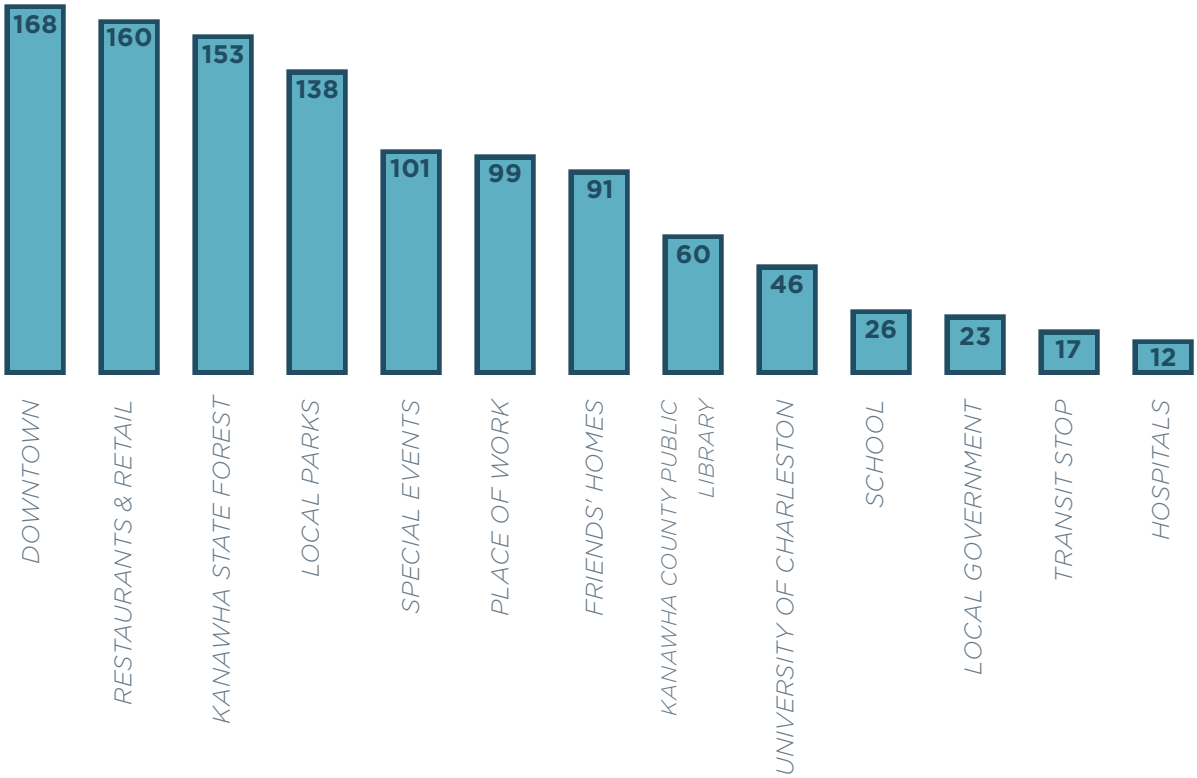
FREQUENCY OF TRAIL USAGE



The majority of survey respondents are frequent bicyclists and trail users. Of the 246 respondents, 40 percent use the trail or bicycle a few times per month and another 31 percent use the trail or bicycle a few times a week. In total, roughly 94 percent of respondents use a trail or bicycle at least a few times a year.

When asked what destination in Charleston respondents would like to get to by bicycling or via the trail, **72 percent of respondents chose the downtown area,** which encompasses a variety of destinations and activities. **Sixty nine percent of respondents would like to bike to restaurants and retail, 66 percent chose Kanawha State Forest, and 59 percent selected local parks and community centers.** Figure R illustrates the percentage of respondents who chose each type of destination.

PREFERRED DESTINATIONS BY BICYCLE OR TRAIL (NUMBERS INDICATE TALLIED VOTES)



PUBLIC COMMENT SECTION

Respondents submitted over 100 general comments and suggestions through the survey. The following provides highlights from those submissions.

"I would love to see the City of Charleston Council partnering with Kanawha County Commission to **collaboratively plan city and county bike paths**"

"**Hope that the entire trail system will be multi-use** - bike, run, walk, roller blading, baby carriages, etc."

"1. Create **safer Kanawha City Bridge crossing lane** 2. Create **route through West Side** from C and O Bridge to Old Iron Bridge across Elk River and Bullitt Street - unused train right of way exists. 3. Refurbish C and O Bridge (see Little Rock AS's bike trail)"

"I'd pay lots of extra city taxes to get a **trail to Kanawha State Forest!**"

"Would love to see **biking trails that are safe and without auto traffic**. Having benches scattered along the trail would be extra nice."

"Bicycling in Charleston has to be multi-faceted to attract various interest groups related to bicycling. Each on their own, bicycle commuting, bicycle tourism, and recreational bicycling aren't popular enough in Charleston to warrant a system designed for any one of those three categories. Instead, a network must exist in Charleston that is capable of catering to each of the three activities in combination. **Imagine an existing mountain trail that is linked by a common trailhead to a system of bike lanes that lead to downtown Charleston.** Potential for this could be at the foot of the Carriage Trail. Daily commuters could park their cars there and ride into downtown for work or play. Recreational bikers could bike down the Carriage Trail and ride on into town via the South Side Bridge to enjoy lunch on Capitol Street. Finally, Charleston could leverage this unique marriage of rural and urban trails to attract tourists. After all, **how many cities offer the opportunity to bike in the forest one minute and through an urban environment the next?"**

Bicycle Suitability Analysis

DEMAND ANALYSIS INTRODUCTION

The consultant team conducted a Bicycle Suitability Analysis (BSA) for the City of Charleston, WV Bike and Trail Master Plan. BSA identifies expected demand for bicycle and trail facilities by overlaying the locations where people live, work, play, and go to school into a composite sketch of regional demand for bicycling and walking activity. When combined with the results of the "supply analysis" included within the overall bicycle suitability methodology, the composite results can be used to help identify areas in need of improvement and where there is high demand for bicycle and trail facilities.

This section summarizes the method and results of the Demand Analysis for the project study area. The models were tailored to the City of Charleston using the available data from the City of Charleston, the West Virginia GIS Technical Center, the Regional Intergovernmental Council, the U.S. Census, and West Virginia Department of Transportation.

DATA SOURCES

The following data inputs were incorporated into the Live, Work, Play demand model. Table 2.3 displays each variable, its source, and notes on limitations of the available data and assumptions that were made.

Table 2.3 Sources of the Live, Work, Play, Learn Model Inputs

Model Input	Source	Notes
Total Population	2010 U.S. Census	Summarized by census block
Total Employment	2010 U.S. Census	Summarized by census block
School Location	City of Charleston	Includes elementary, middle, and high schools; Colleges and Universities
Existing bicycle and trail facilities	City of Charleston; WV GIS Technical Center	
Commercial Destinations	2010 U.S. Census	Commercial destinations are approximated by service sector jobs (Retail trade; arts, entertainment, recreation; accommodation and food services; other services)
Connectivity Score	Does the project connect to other projects within an implementation phase?	Connectivity to other projects

METHODOLOGY

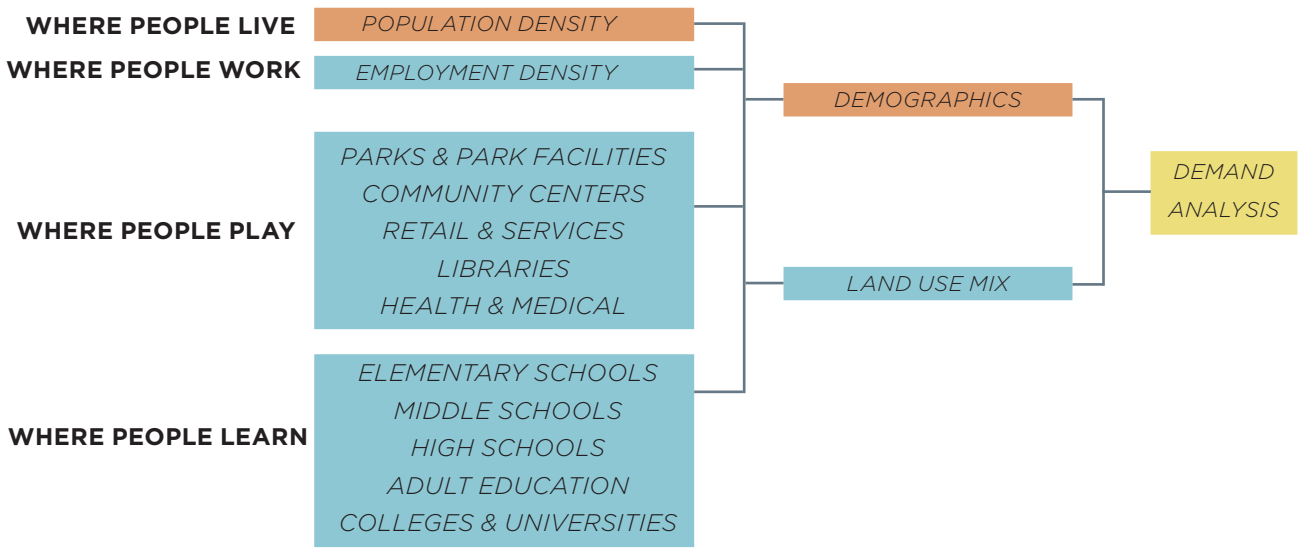
OVERVIEW

The Live, Work, Play Analysis is an objective, data-driven process to identify the demand for bicycle and trail facilities. The demand potential was measured based on the proximity and density of trip generators (such as homes and workplaces) and trip attractors (such as shopping centers, parks, and trails) to establish potential for walking and bicycling trips. The resulting models represent "heat maps" that displays hot spots based on the Live, Work, Play, and Learn factors and then as a heat map showing a composite of all the factors.

APPROACH

The demand model identifies expected pedestrian and bicycle activity by overlaying the locations where people live, work, play, and go to school into a composite sketch of regional demand. The model figure below summarizes this approach.

DEMAND MODEL APPROACH



SCALE OF ANALYSIS

The demand model relies on spatial consistency in order to generate logical distance and density patterns. It is for this reason that all scores are aggregated to a central location at the census block level and then the census block corner. Census blocks closely represent the street network and therefore Census block corners closely represent street corners, where foot and bicycle traffic is prevalent. This method is based on the Low-Stress Bicycling and Network Connectivity report (Mineta Transportation Institute, May 2012). The report discusses the benefits of using a smaller geographic setting for pedestrian and bicycle demand analyses rather than using more traditional traffic model features such as census block groups, census tracts, or traffic analysis zones. Due to the low speed of pedestrian movement, a much smaller geographic unit of analysis is needed.

SCORING METHOD

The demand model's scoring method is a function of density and proximity. Scores are a result of two complementing forces: distance decay – the effect of distance on spatial interactions yields lower scores for features farther away from other features; and spatial density – the effect of closely clustered features yields higher scores. Scores will increase in high feature density areas and if those features are close together. Scores will decrease in low feature density areas and if features are further apart.

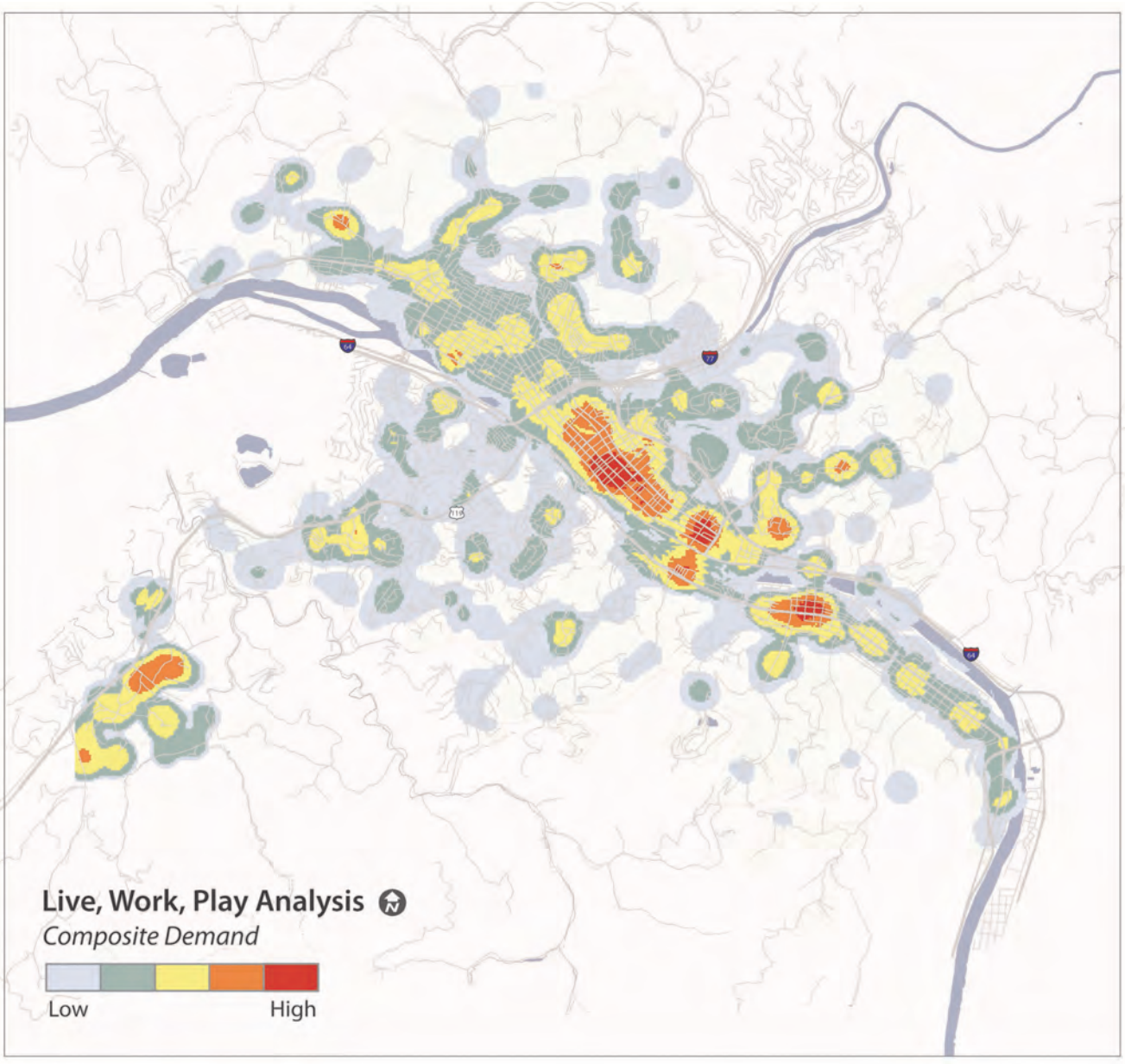
ANALYSIS RESULTS

The areas shaded more deeply in red represent higher demand areas relative to other colors on the ramp. A series of maps by individual category can be found in Appendix C - Bikespace Analysis.

COMPOSITE DEMAND

The map on the following page displays the composite demand for the Live, Work, Play, and Learn factors, revealing the composite demand for bicycle and trail facilities in the City of Charleston. The highest composite demand is located in the downtown area, near the state capital, north Kanawha City, and the cluster of shops along Route 119 . An important takeaway to consider is the **high overall demand along the north side of the Kanawha River** – providing transportation and recreation access to the river as a natural amenity should be a priority when developing the bicycle and trail network.

COMPOSITE DEMAND MAP



SUPPLY ANALYSIS INTRODUCTION

Building on the Live, Work, Play Analysis, the consultant team conducted a Speed and Preliminary Bikeway Overlay Analysis to assess existing conditions and help determine roadway suitability. Similar to how the Live, Work, Play Model assess "demand," the Speed and Preliminary Bikeway Overlay Analysis identifies "supply" by assessing the existing roadway network. This analysis helps determine a bicyclist's level of comfort on the roadway network and identify existing corridors that may be suitable for bicycle facilities.

DATA SOURCES

The following data inputs were incorporated into the Speed and Preliminary Bikeway Overlay Model. Table 2.4 displays each variable, its source, and notes on limitations of the available data and assumptions that were made.

METHODOLOGY

The supply factor is created by identifying a bicyclist's level of comfort on each road throughout the city by accounting for factors such as the posted speed limit and Annual Average Daily Traffic (AADT). The analysis is also an important first step toward assessing the type of bicycle facility that may be appropriate for a particular corridor and The Speed and Preliminary Bikeway Overlay Analysis also relies on spatial consistency. Feature data sets provided for this analysis were collected from a variety of sources and are considered accurate on a variety of geographic scales. Posted speed limit and AADT data (where available) was used to display network speeds as they affect bicyclists comfort and to determine preliminary bicycle boulevard and bike lane recommendations.

ANALYSIS RESULTS

DEMAND AND SUPPLY OVERLAY

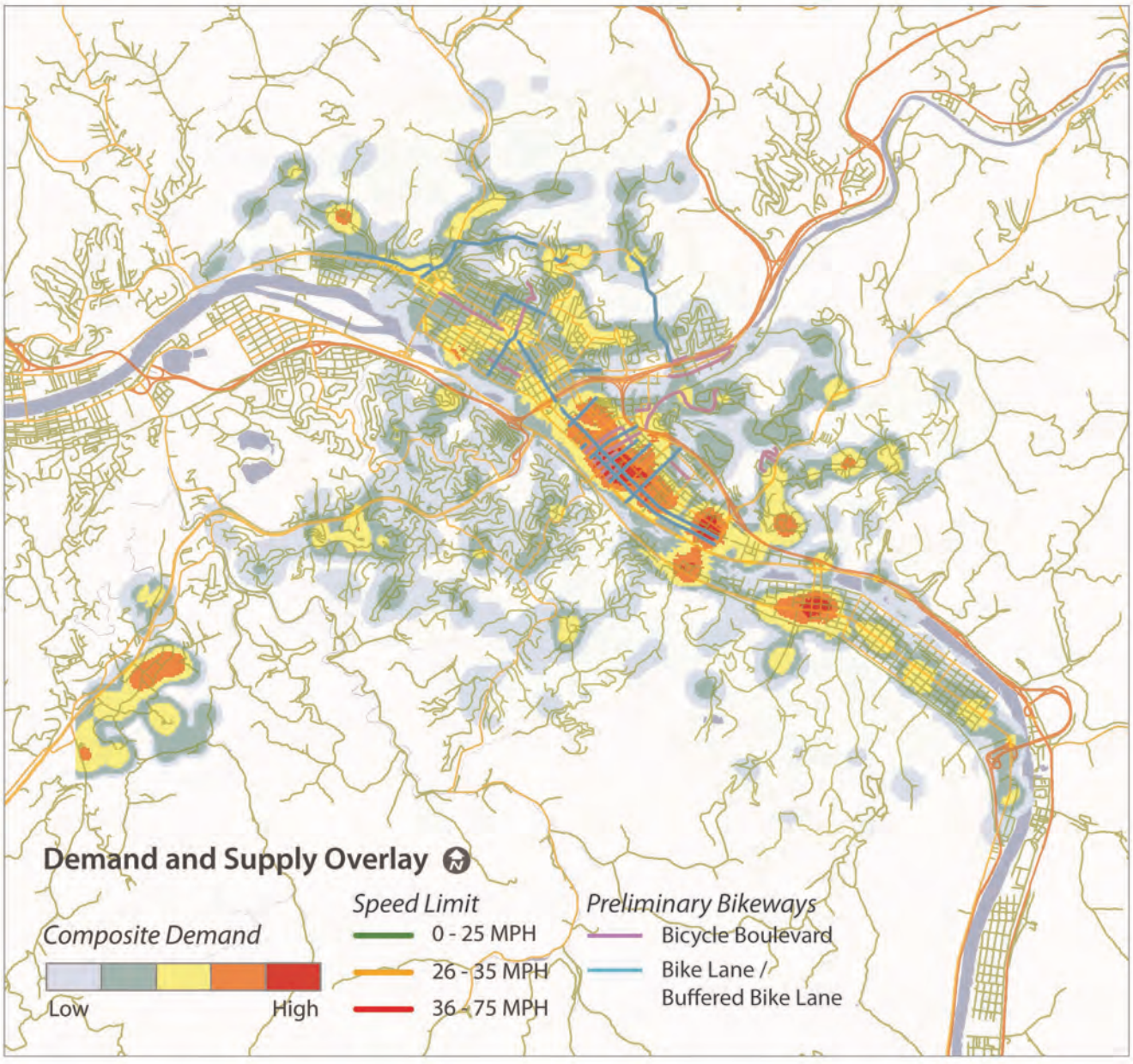
Overlaying the speed and preliminary bikeway analyses with the Live, Work, Play Model allows us to indicate geographic patterns of high and low demand and the supply of the existing network as it relates to posted speed limits and AADT.

Areas with high demand for bicycling and lower speed and volume roadways have the potential to implement more cost-effective solutions that do not require physical separation. Additionally, corridors with higher speed and volume roadways but high demand will warrant a separated facility to facilitate access.

Table 2.4 Sources of the Speed and Preliminary Bikeway Inputs

Model Input	Source	Notes
Posted Speed	U.S. Census; Tiger Line Data	Summarized as 25 MPH or less, 26 MPH – 35 MPH, and 36 MPH and over
Average Annual Daily Traffic (AADT)	City of Charleston	AADT was only available in select locations

DEMAND AND SUPPLY OVERLAY MAP



ONLINE INTERACTIVE MAP

From March 13th through April 13th, residents, commuters, and visitors to Charleston were invited to suggest specific improvements for Charleston's bicycle and trail network using an online interactive mapping tool. Over **340 suggestions were mapped.** Of these suggestions, residents, commuters, and visitors identified 45 destinations that they either currently access via bicycling, or wish to be bicycling accessible. Map contributors also identified over 40 gaps and barriers to bicycling or trail use. The following section provides four maps of comments provided by users and discusses the key findings of this public input.

GAPS AND BARRIERS

Of the identified gaps, one comment for improvement was to **increase accessibility of the trail on Edgewood Drive in order to engage students at nearby Edgewood Elementary School**. Other gap suggestions included constructing a bridge to **connect Coonskin Park, Elk River Trail, and an abandoned rail line at Barlow Drive.**

Barriers were generally dispersed throughout Charleston, though one noticeable **cluster of barriers emerged around 35th Street SE and the Kanawha City Bridges**. The barriers identified here were too narrow of a space for adequate pedestrian and bicycle passing, lack of pedestrian and cyclist-scaled lighting, and too low of a railing against the river to ensure safety.

PRIORITY ROUTES

Resident, commuter, and visitor feedback also indicated that **addressing potholes along Barlow Road, connecting Charleston to South Charleston, widening berms along Route 114, and providing a safe connection to the Southridge Center** are desired improvements for bicyclists who would like to use those routes but currently do not. On routes that are used, the following improvements were suggested:

- Regular street sweeping of MacCorkle Avenue
- Repurpose an old streetcar right of way along Edgewood Drive as a multi-use trail, and
- Repave lower Donnally Road

The most predominant route identified by map users as in need of improvements was a **loop stretching from the Kanawha bridges and Kanawha Boulevard to Patrick Street and MacCorkle Avenue**. For routes labeled "Routes I Like and Currently Use", map contributors almost exclusively mapped routes in east Charleston. The two exceptions to this are Kennawa Drive and Davis Creek Road between Oakhurst Drive and Connell Road. No "currently used" routes were identified in Charleston on the north side of the Kanawha River.

Online Interactive Map Results

NW Quadrant

Points of Interest

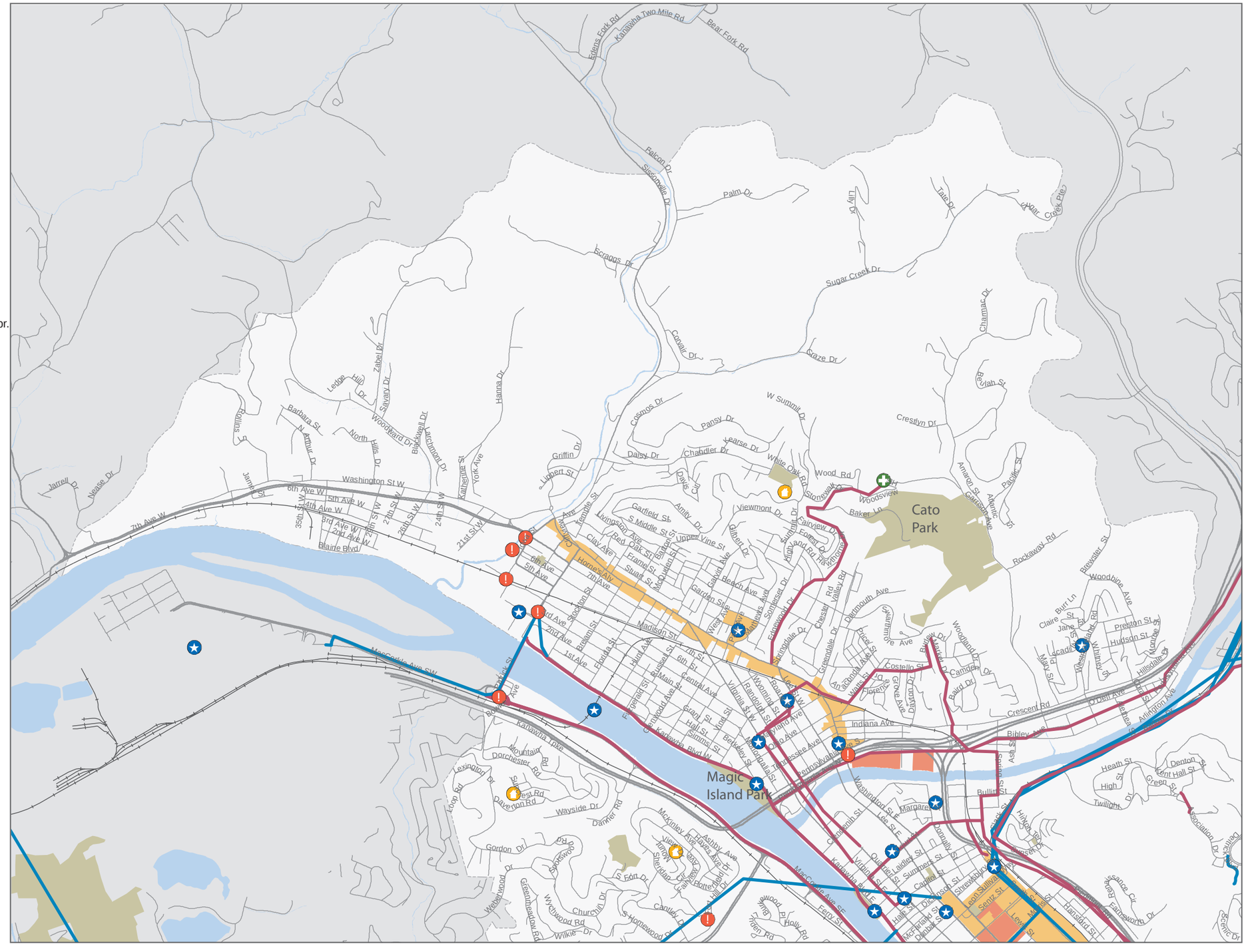
- Home
- Destination
- Gap
- Barrier / Conflict

Drawn Routes

- Route I Like and Currently Use
- Route I Use but Could be Improved
- Route I'd Like to Use but Needs Impr.

Areas of Interest

- Park
- Historic District
- Main Street District
- City Boundary
- Hospital / Med. Center



0 0.25 0.5 Miles

Online Interactive Map Results

NE Quadrant

Points of Interest

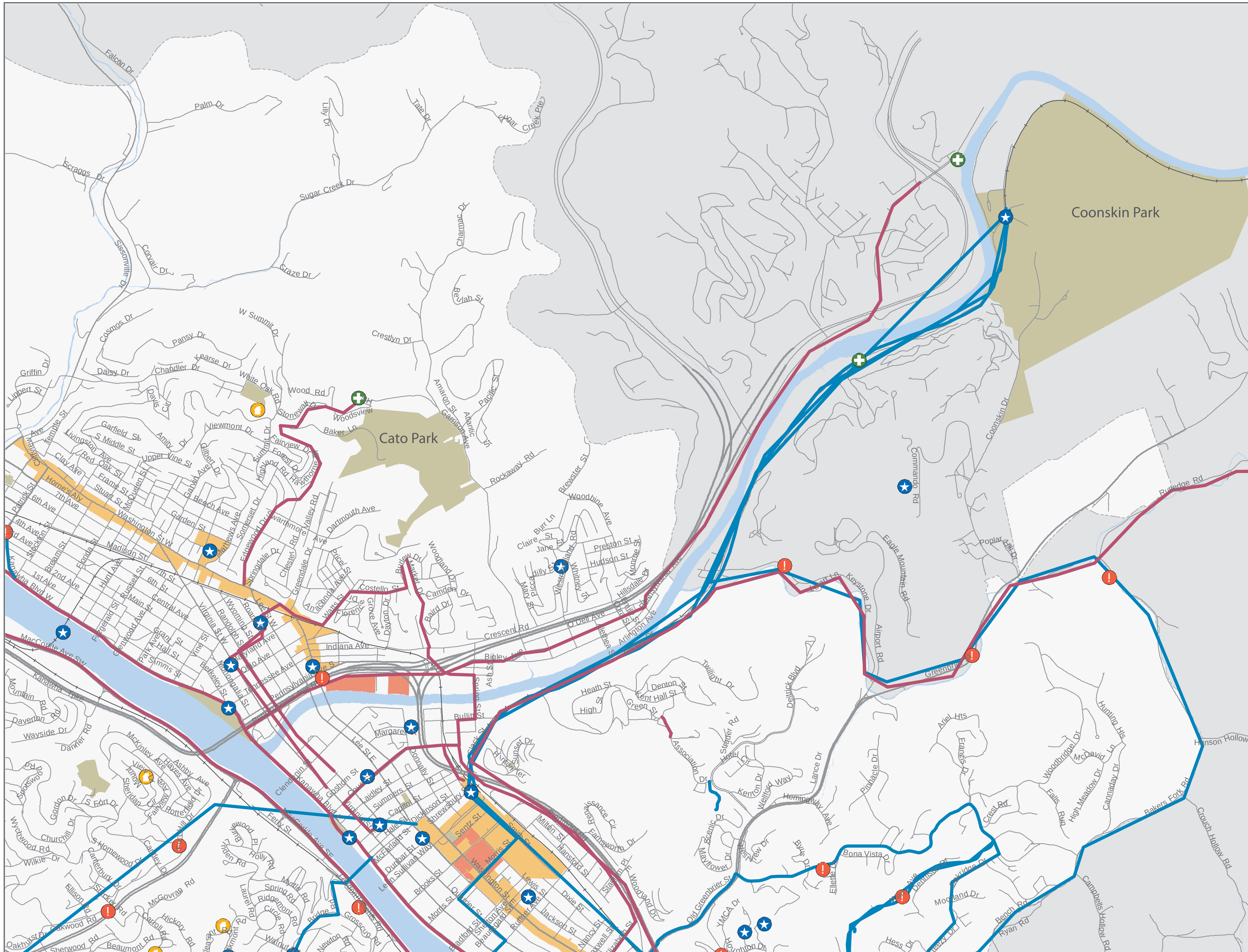
- Home
- Destination
- Gap
- Barrier / Conflict

Drawn Routes

- Route I Like and Currently Use
- Route I Use but Could be Improved
- Route I'd Like to Use but Needs Impr.

Areas of Interest

- Park
- Historic District
- Main Street District
- City Boundary
- Hospital / Med. Center



0 0.25 0.5 Miles

Online Interactive Map Results

SW Quadrant

Points of Interest

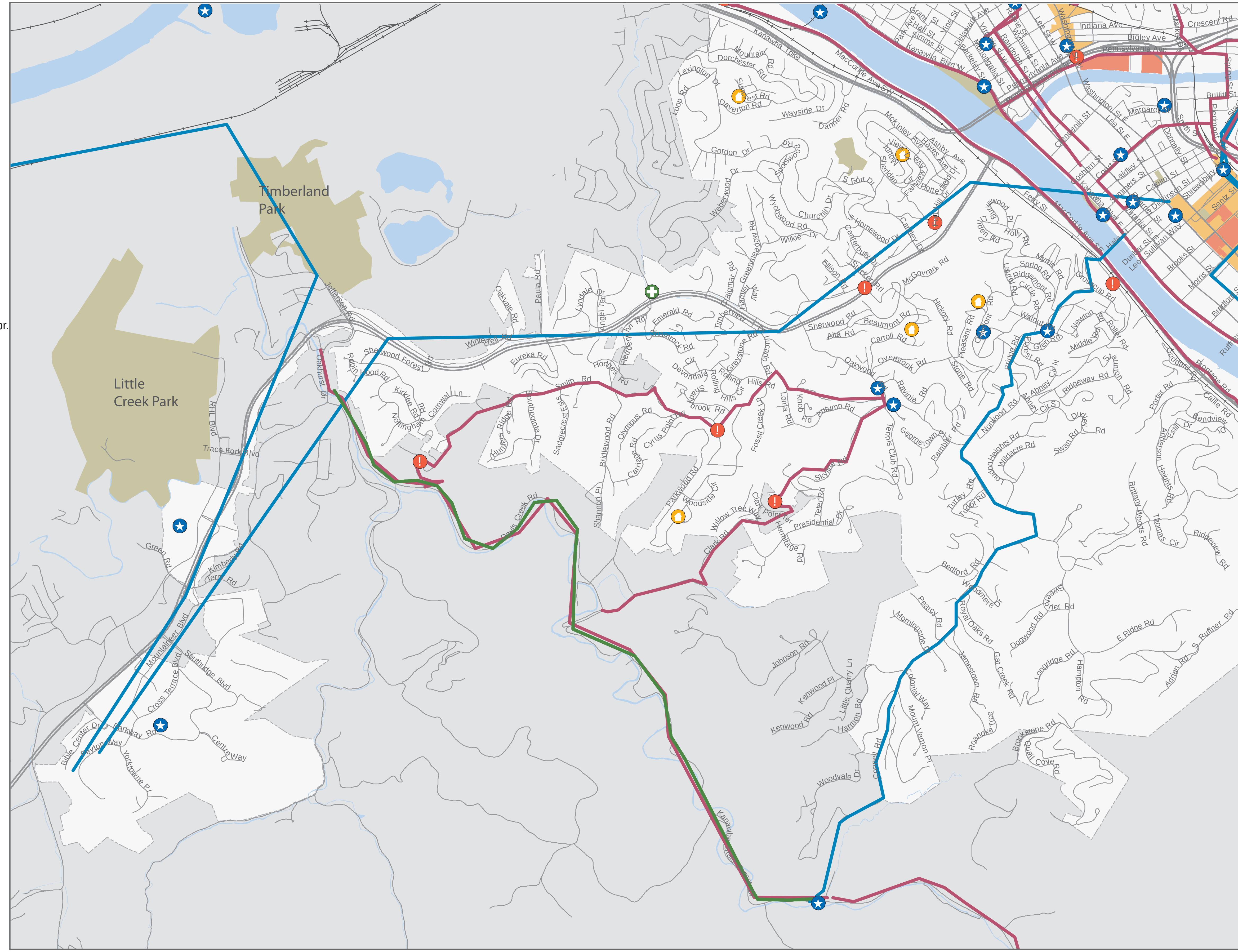
- Home
- Destination
- Gap
- Barrier / Conflict

Drawn Routes

- Route I Like and Currently Use
- Route I Use but Could be Improved
- Route I'd Like to Use but Needs Impr.

Areas of Interest

- Park
- Historic District
- Main Street District
- City Boundary
- Hospital / Med. Center



0 0.25 0.5 Miles

Online Interactive Map Results

SE Quadrant

Points of Interest

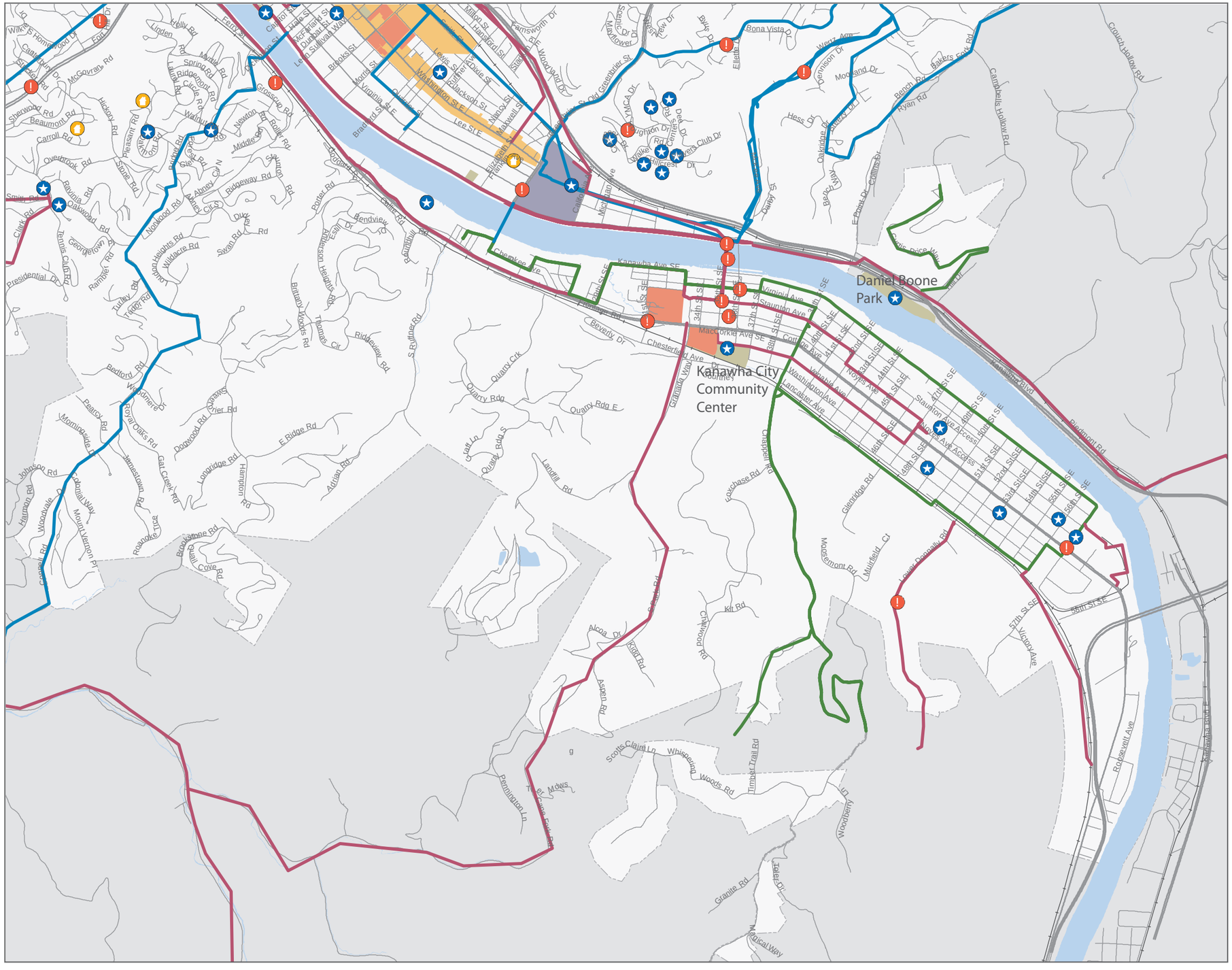
- Home
- Destination
- Gap
- Barrier / Conflict

Drawn Routes

- Route I Like and Currently Use
- Route I Use but Could be Improved
- Route I'd Like to Use but Needs Impr.

Areas of Interest

- Park
- Historic District
- Main Street District
- City Boundary
- Hospital / Med. Center



0 0.25 0.5 Miles

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Utilizing low-volume streets, such as neighborhood streets, for bicycle boulevards is a quick, easy, and cost-effective way to expand the bike network for users of all ages and abilities.

A bicyclist enjoys a springtime ride along Kanawha Avenue, a designated bicycle route.

III. NETWORK RECOMMENDATIONS

Planning of the automobile city focuses on saving time. Planning for the accessible city, on the other hand, focuses on time well spent.

-- Robert Cervero, Chair of City & Regional Planning, UC Berkeley

Introduction

The following sections present the bicycle network recommendations for the City of Charleston. The intent of these recommendations is to present **a long-term vision for the bicycling network, ensuring accessibility for potential bicyclists in communities across the City** and potential future areas of growth around Charleston.

The recommendations presented in the maps on the following pages directly reflect the information collected and presented in the Existing Conditions Analysis related to existing planning efforts, demand, equity, safety, public input, best practices, and the City of Charleston's high aspirations for becoming a premiere bike-friendly community.

Overview of Planning Process

A variety of on and off-street bicycle facilities are recommended due to 1) the range of abilities and comfort levels of bicyclists; 2) the range of conditions for bicycling on different roadway environments; and 3) local preferences identified through the public input process. This section presents an overview of these facility types in order to orient the reader to the network recommendations presented in the following sections. More detailed information of the design of the bicycle facilities presented in this section can be found in the Design Guidelines presented in Appendix E.

The recommended bicycle network is made up of the following core types of facilities:

On-Road Facilities
Cycle Tracks
Buffered Bicycle Lanes
Bicycle Lanes
Paved Shoulders
Neighborhood Greenways/Bicycle Boulevards
Shared Lane Markings
Signed Bicycle Routes
Off-Road Facilities
Shared Use Paths (also known as greenways and multi-use paths)
Sidepaths

The recommended strategies for implementing the proposed facilities include road widening, lane narrowing, lane reconfiguration, parking reduction, adding markings/signage, and new construction. These strategies are discussed in further detail in Chapter IV and the Design Guidelines presented in Appendix E. In addition, strategic speed limit reductions and intersection improvements would add to overall bicycle and pedestrian safety and comfort throughout the City.

Bicycle Facility Types

ON-ROAD BICYCLE FACILITIES

On-road bikeway types are used typically on arterial, collector, and subcollector roadways where motor vehicle traffic volumes or speeds are relatively high. These facility types are ordered hierarchically from greatest degree of bicycle/motor vehicle separation to lowest in the following sections. In general, higher order facilities are preferable on higher-order roadways streets and vice versa.

CYCLE TRACK

A cycle track is an exclusive bike facility that combines the user experience of a separated path with the on-street infrastructure of a conventional bike lane. A cycle track is physically separated from motor traffic and distinct from the sidewalk. Cycle tracks have different forms but all share common elements—they provide space that is intended to be exclusively or primarily used by bicycles, and are separated from motor vehicle travel lanes, parking lanes, and sidewalks. In situations where on-street parking is allowed, cycle tracks are located to the curb-side of the parking (in contrast to bike lanes).

Cycle tracks may be one-way or two-way, and may be at street level, sidewalk level or at an intermediate level. If at sidewalk level, a curb or median separates them from motor traffic, while different pavement color/texture separates the cycle track from the sidewalk. If at street level, they can be separated from motor traffic by raised medians, on-street parking or bollards.

By separating bicyclists from motor traffic, cycle tracks can offer a higher level of comfort than bike lanes and are attractive to a wider spectrum of the public. Intersections and approaches must be carefully designed to promote safety and facilitate left-turns from the right side of the street.

BUFFERED BICYCLE LANES

Buffered bike lanes are conventional bicycle lanes paired with a designated buffer space, separating the bicycle lane from the adjacent motor vehicle travel lane and/or parking lane. Buffered bike lanes follow general guidance for buffered preferential vehicle lanes as per MUTCD guidelines.

Buffered bike lanes are designed to increase the space between the bike lane and the travel lane and/or parked cars, providing more comfortable conditions for bicyclists. This treatment is appropriate for bike lanes on roadways with high motor vehicle traffic volumes and speed, adjacent to parking lanes, or a high volume of truck or oversized vehicle traffic.

BICYCLE LANES

A bicycle lane is a portion of the roadway that has been designated by striping, signing, and pavement markings for the preferential and exclusive use of bicyclists. Bicycle lanes are always located on both sides of the road (except one way streets), and carry bicyclists in the same direction as adjacent motor vehicle traffic. The minimum width for a bicycle lane is four feet; five- and six-foot bike lanes are typical for collector and arterial roads.

Where bicycle lanes are recommended in this plan, speed limit reduction should be strongly considered.

PAVED SHOULDERS

Typically found in less dense areas, shoulder bikeways are roadways with paved, striped shoulders. While there is no minimum width for paved shoulders, 4' or greater is preferred for cyclists. In addition to the safety and comfort benefits for cyclists, paved shoulders also reduce roadway maintenance, improve roadway drainage, provide a stable walking surface for pedestrians when sidewalks cannot be provided, reduce vehicular crashes, and provide emergency stopping space for broken-down vehicles.

Shoulder bikeways often, but not always, include signage alerting motorists to expect bicycle travel along the roadway. Shoulder bikeways should be considered a temporary or rural treatment, with full bike lanes planned for construction if the roadway is widened or completed with curb and gutter.

BICYCLE BOULEVARDS NEIGHBORHOOD GREENWAYS/

Bicycle boulevards, also called neighborhood greenways, are low-volume, low-speed neighborhood streets around core areas of the City modified to enhance bicyclist comfort and safety by using treatments such as signage, pavement markings, traffic calming and/or traffic reduction, and intersection modifications. Pedestrian and bicycle cut-throughs (recommended in the following section) can also be integrated into the bicycle boulevard network to allow for continuous bike travel off of major corridors. These treatments allow through bicycle movements while discouraging motorized through-traffic.

Jurisdictions throughout the country use a wide variety of strategies to determine where specific treatments are applied. While no federal guidelines exist, several best practices have emerged. At a minimum, neighborhood greenways should include distinctive pavement markings and wayfinding signs. They can also use combinations of traffic calming, traffic diversion, and intersection treatments to improve the bicycling environment.

The appropriate level of treatment to apply is dependent on roadway conditions, particularly motor vehicle speeds and volumes.

Traffic conditions on bicycle boulevards should be monitored to provide guidance on when and where treatments should be implemented. When motor vehicle speeds and volumes or bicyclist delay exceed the preferred limits, additional treatments should be considered.

MARKED, SHARED ROADWAYS

A marked shared roadway is a general purpose travel lane marked with shared lane markings (SLM) used to encourage bicycle travel and proper positioning within the lane. Placed in a linear pattern along a corridor (typically every 100-250 feet), shared lane markings make motorists more aware of the potential presence of cyclists; direct cyclists to ride in the proper direction; and remind cyclists to ride further from parked cars to avoid “dooring” collisions.

In constrained conditions, the SLMs are placed in the middle of the lane. On a wide outside lane, the SLMs can be used to promote bicycle travel

to the right of motor vehicles. In all conditions, SLMs should be placed outside of the door zone of parked cars and used on roadways with speed limits of 35 mph or less (below 30 mph preferred).

BIKE ROUTES

Bike routes employ bikeway signage, and may also use pavement markings, to guide bicyclists to popular destinations on low-volume, bike-friendly roadways. Bike routes are distinct from bicycle boulevards in that they are mostly recommended as a rural roadway treatment. Like bicycle boulevards, bike routes serve as an alternative to roads that are less comfortable for cycling due to higher motor vehicle volumes and/or speeds. They were chosen as part of the network because of the importance of overall system connectivity and connectivity to destinations such as parks, neighborhoods, and schools, but offer shorter connections than do bicycle boulevards.

INTERSECTION TREATMENTS

There are a variety of intersection treatments that can be applied to make a safer and more comfortable crossing environment for bicyclists. As seen in the example above, green paint delineates the preferred path of travel for the bicyclist through the intersection and indicates a potential conflict to motorists.

WAYFINDING

Wayfinding is spatial problem solving. Successful wayfinding orients people to their surroundings and informs them on how to best navigate to their destination along preferred bicycle routes. Apart from serving as a guide to destinations, wayfinding increases users' comfort and accessibility to the bike network. It can offer a sense of safety – familiarizing users with the network and overcoming "barriers to entry" for people who are not frequent bicyclists.

Basic elements to include in wayfinding signs include destinations, distances, and "riding time". Often the inclusion of riding times dispels common overestimations of time and distance thus encouraging walking or cycling instead of defaulting to the car. Signs should be placed at decision points (where the navigator must choose whether to continue their route or change direction) along bike routes and bicycle boulevards or neighborhood greenways. See Appendix E for details on wayfinding sign types, sign placement, and maintenance.

Right: Bicycle wayfinding is not only an important for navigating the bicycle network, but also as an encouragement tool that makes people aware of how easy it can be to bicycle to popular destinations.

OFF-ROAD BICYCLE FACILITIES

Off-road bikeways are intended to create completely separated spaces for pedestrians and bicyclists. These are the preferred facility for novice and average bicyclists. Special consideration must be given to environmental conditions and for all roadway crossings.

SHARED-USE PATH

A shared use path allows for two-way, off-street bicycle use and also may be used by pedestrians, skaters, wheelchair users, joggers and other non-motorized users. These facilities are frequently found in parks, along rivers, beaches, and in greenbelts or utility corridors where there are few conflicts with motorized vehicles. Path facilities can also include amenities such as lighting, signage, and fencing (where appropriate). Key features of shared use paths include:

- Frequent access points from the local road network
- Directional signs to direct users to and from the path.
- A limited number of at-grade crossings with streets or driveways.
- Terminating the path where it is easily accessible to and from the street system.
- Separate treads for pedestrians and bicyclists when heavy use is expected

SIDEPATH

Shared use paths along roadways, also called Sidepaths, are a type of path that run adjacent to a street. Because of operational concerns it is generally preferable to place paths within independent rights-of-way away from roadways. However, there are situations where existing roads provide the only corridors available. When designed correctly, these facilities have the ability to provide a high level of comfort for pedestrians and bicyclists. However, the AASHTO Guide for the Development of Bicycle Facilities cautions practitioners of the use of two-way sidepaths on urban or suburban streets with many driveways and street crossings. Where implemented, sidepaths should be coupled with strict access management regulations or improvements.

Bikeway Project Development

Bikeway network development utilized a number of different analyses, described in the Existing Conditions section of this plan, and planning judgment to determine what project types are warranted along roadways throughout Charleston. These recommendations also include new off-street bicycle and pedestrian accommodation recommendations where they serve a major connectivity function in the network. The ultimate goal of the bikeway network is providing connectivity to destinations such as retail centers, job centers, schools, and recreation opportunities for all residents.

NATURE OF RECOMMENDATIONS

Recommended facilities for bicyclists strive to create a safe and comfortable biking environment for users of all ages and abilities and reflect national best practices in considering conditions such as traffic volumes, traffic speeds, and available roadway rights-of-way. Recommendations are considered planning-level, meaning that they should be used as a guide when implementing recommendations. In many cases, more detailed design studies will be required to examine specific site conditions and develop specific designs that reflect local conditions and constraints. In addition, these maps reflect the long-term vision for the network—implementation will not happen overnight. However, this Plan also contains an Implementation Plan which provides a roadmap for implementing recommendations in a logical manner. The Implementation Plan prioritizes the most feasible projects that provide the greatest return in terms of need, safety improvement, and costs. The Implementation Plan also projects costs, develops a timeline for implementation and provides other resources such as potential funding sources.

RECOMMENDATIONS OVERVIEW

The tables below provide a summary of improvements shown in maps on the following pages broken down by miles for linear facilities, or number of locations for spot improvements. Refer to the previous section for an overview of the different recommended improvement types.

Table 3.1 Mileage Summary of Recommended Bikeway Facilities

Facility Type	Miles
Cycle Track	10.3
Buffered Bike Lane	4.7
Bike Lane	12.3
Shoulder Bikeway	10.4
Bicycle Boulevard	61.5
Shared Lane Markings	2.7
Bike Route	24.6
Shared-Use Path	12.7
Rail with Trail	4.5
Total Mileage	143.7

Table 3.2 Bicycle Spot Improvements Summary

Type	Quantity
Bicycle/Pedestrian Bridge	1
Bicycle/Pedestrian Cut-Through	3
Crossing Improvements	7
Intersection Improvements	11
Trailhead Opportunity	3

Fold Out for 11x17 Map

Charleston, WV
Bike & Trail Master Plan

Bike & Trail Network Recommendations

Recommended_Facility

- Bike/Ped Cut-Through
- Bike Route
- Bicycle Boulevard
- Shared Lane Markings
- Shoulder Bikeway; Bike Lane
- Buffered Bike Lane
- Cycle Track
- Sidepath; Shared-Use Path; Greenway Trail
- Rail-with-Trail
- Long-term Improvement

Existing Facilities

- Bike Route
- Multi-Use Path

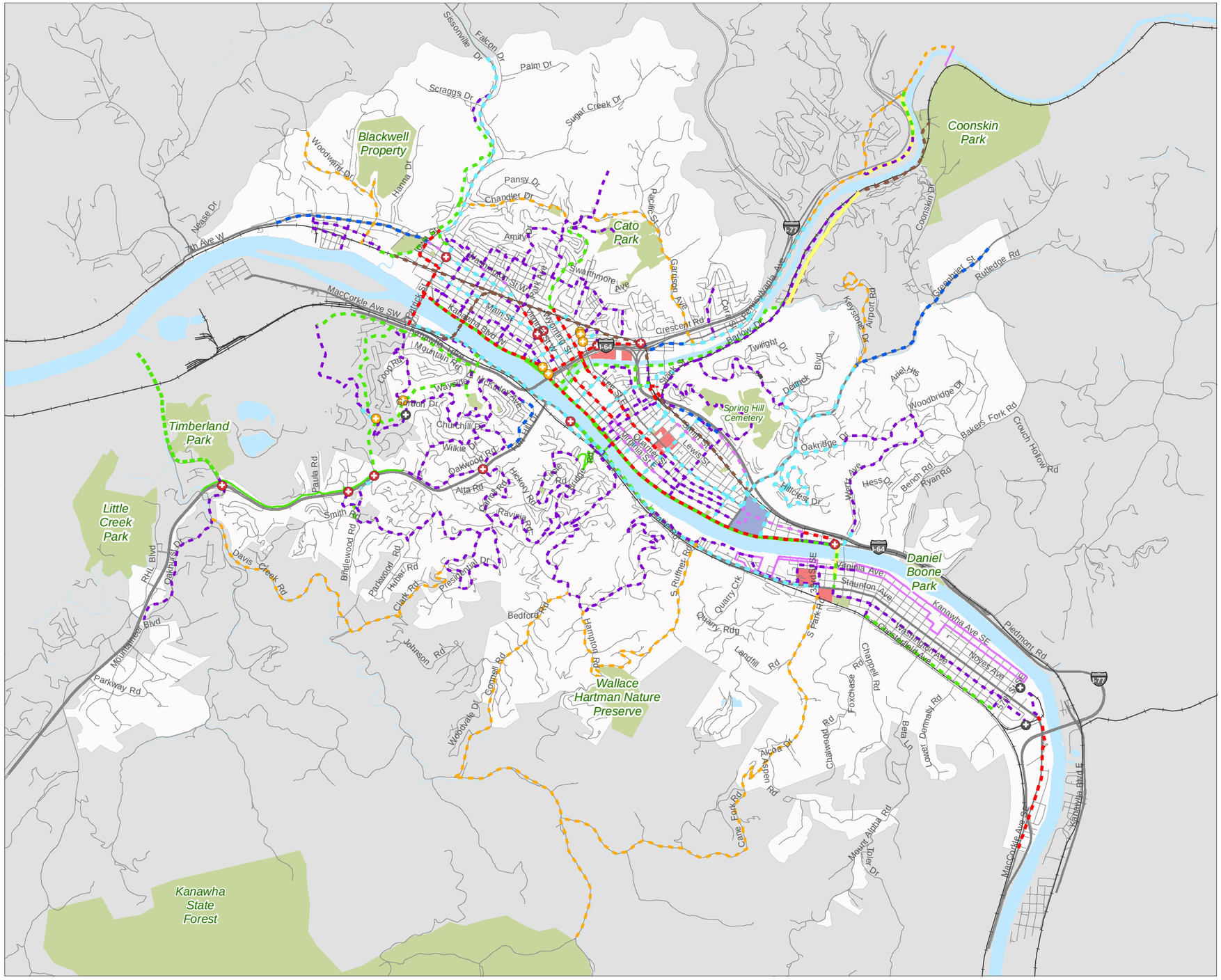
Proposed Improvements

- Bicycle/Pedestrian Cut-Through
- Crossing Improvements
- Intersection Improvements

Areas of Interest

- Park
- City Boundary
- State Capitol
- Hospital / Med. Center

0 0.5 1 Miles



Charleston, WV
Bike & Trail Master Plan

Northwest Quadrant

Recommended_Facility

- Bike/Ped Cut-Through
- Bike Route
- Bicycle Boulevard
- Shared Lane Markings
- Shoulder Bikeway; Bike Lane
- Buffered Bike Lane
- Cycle Track
- Sidepath; Shared-Use Path; Greenway Trail
- Rail-with-Trail
- Long-term Improvement

Existing Facilities

- Bike Route
- Multi-Use Path

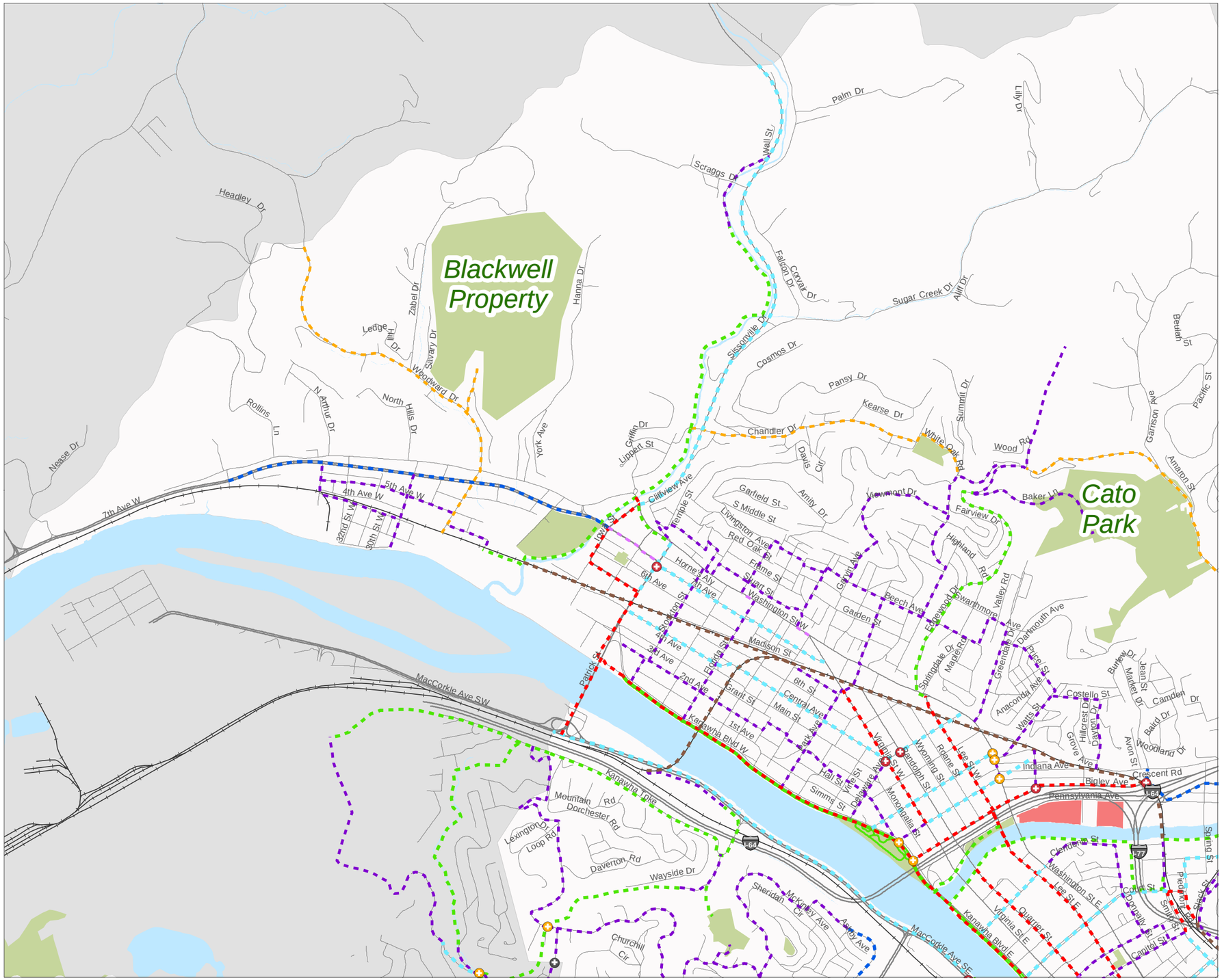
Proposed Improvements

- Bicycle/Pedestrian Cut-Through
- Crossing Improvements
- Intersection Improvements

Areas of Interest

- Park
- City Boundary
- State Capitol
- Hospital / Med. Center

0 0.225 0.45 Miles



Charleston, WV
Bike & Trail Master Plan

Northeast Quadrant

Recommended_Facility

- Bike/Ped Cut-Through
- Bike Route
- Bicycle Boulevard
- Shared Lane Markings
- Shoulder Bikeway; Bike Lane
- Buffered Bike Lane
- Cycle Track
- Sidepath; Shared-Use Path; Greenway Trail
- Rail-with-Trail
- Long-term Improvement

Existing Facilities

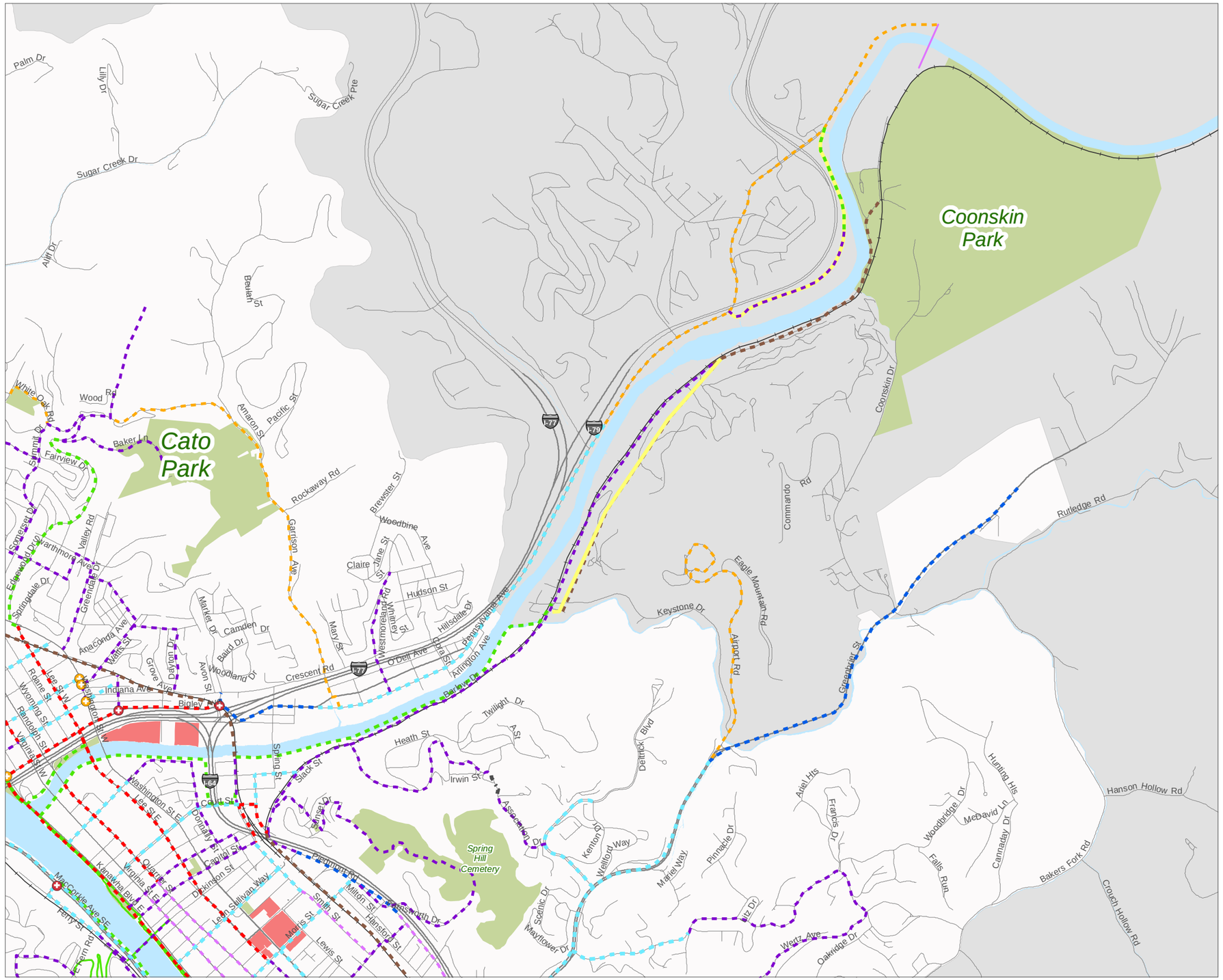
- Bike Route
- Multi-Use Path

Proposed Improvements

- Bicycle/Pedestrian Cut-Through
- Crossing Improvements
- Intersection Improvements

Areas of Interest

- Park
- City Boundary
- State Capitol
- Hospital / Med. Center



0 0.25 0.5 Miles

Charleston, WV
Bike & Trail Master Plan

Southwest Quadrant

Recommended_Facility

- Bike/Ped Cut-Through
- Bike Route
- Bicycle Boulevard
- Shared Lane Markings
- Shoulder Bikeway; Bike Lane
- Buffered Bike Lane
- Cycle Track
- Sidepath; Shared-Use Path; Greenway Trail
- Rail-with-Trail
- Long-term Improvement

Existing Facilities

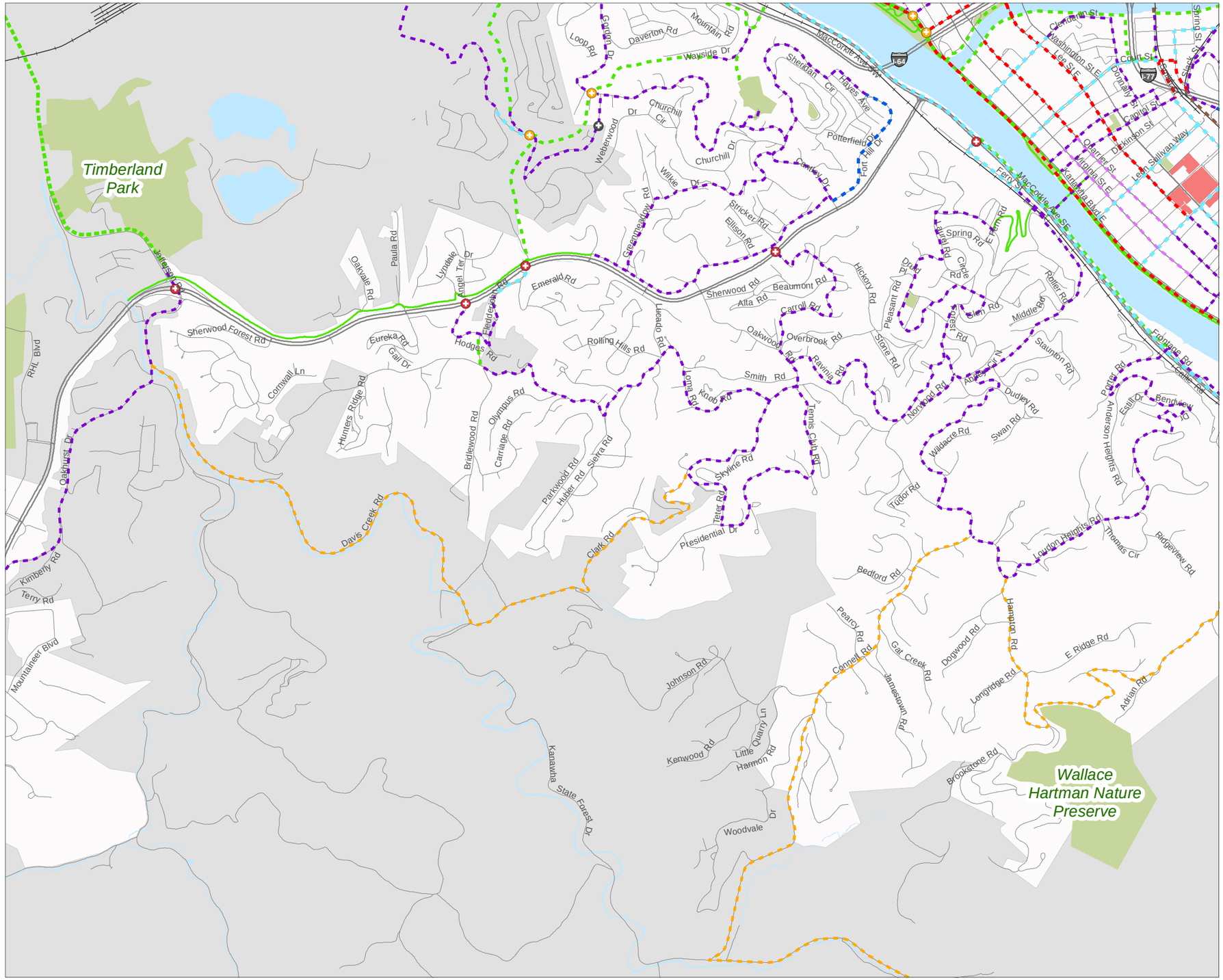
- Bike Route
- Multi-Use Path

Proposed Improvements

- Bicycle/Pedestrian Cut-Through
- Crossing Improvements
- Intersection Improvements

Areas of Interest

- Park
- City Boundary
- State Capitol
- Hospital / Med. Center



0 0.25 0.5 Miles

Charleston, WV
Bike & Trail Master Plan

Southeast Quadrant

Recommended_Facility

- Bike/Ped Cut-Through
- Bike Route
- Bicycle Boulevard
- Shared Lane Markings
- Shoulder Bikeway; Bike Lane
- Buffered Bike Lane
- Cycle Track
- Sidepath; Shared-Use Path; Greenway Trail
- Rail-with-Trail
- Long-term Improvement

Existing Facilities

- Bike Route
- Multi-Use Path

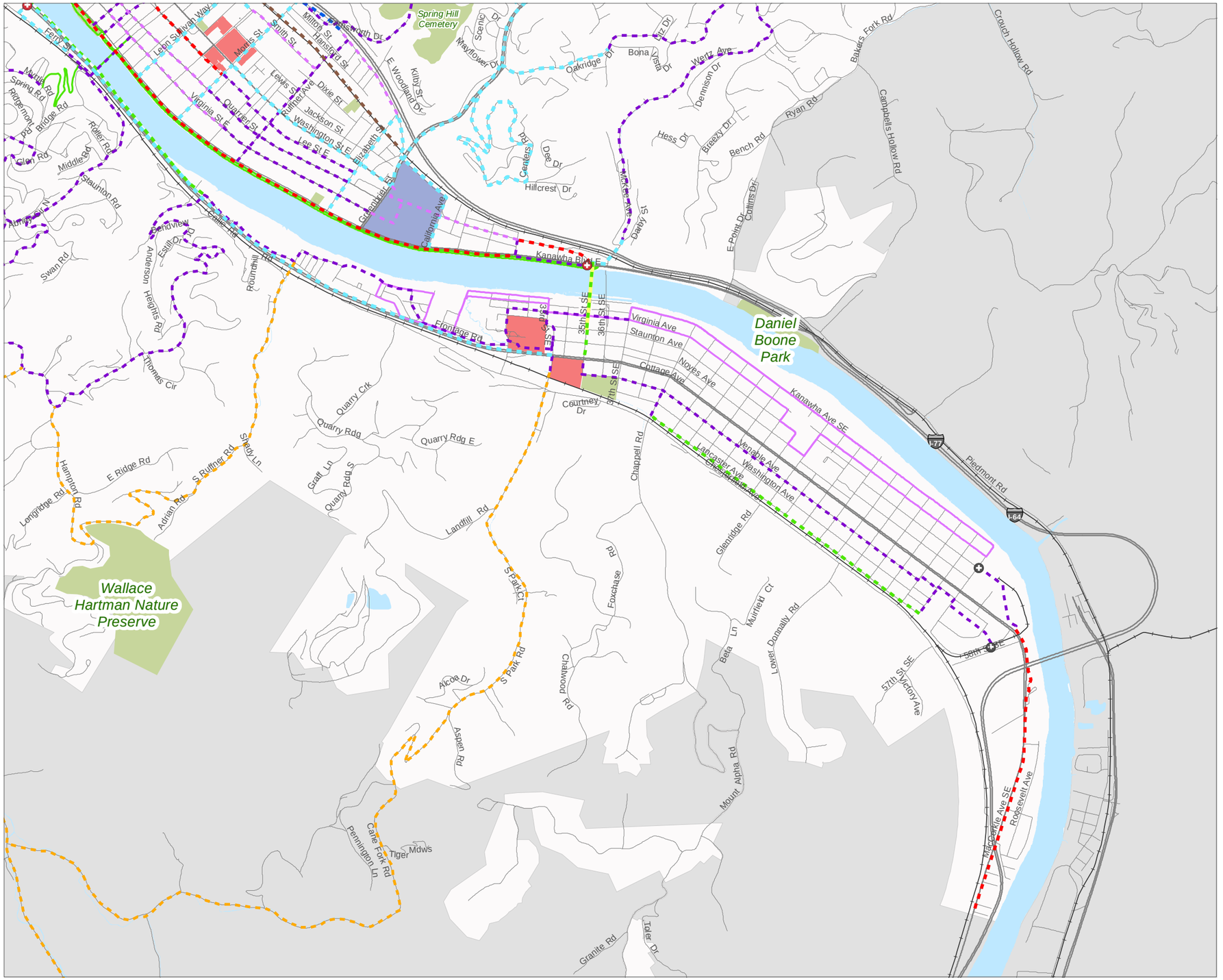
Proposed Improvements

- Bicycle/Pedestrian Cut-Through
- Crossing Improvements
- Intersection Improvements

Areas of Interest

- Park
- City Boundary
- State Capitol
- Hospital / Med. Center

0 0.275 0.55 Miles



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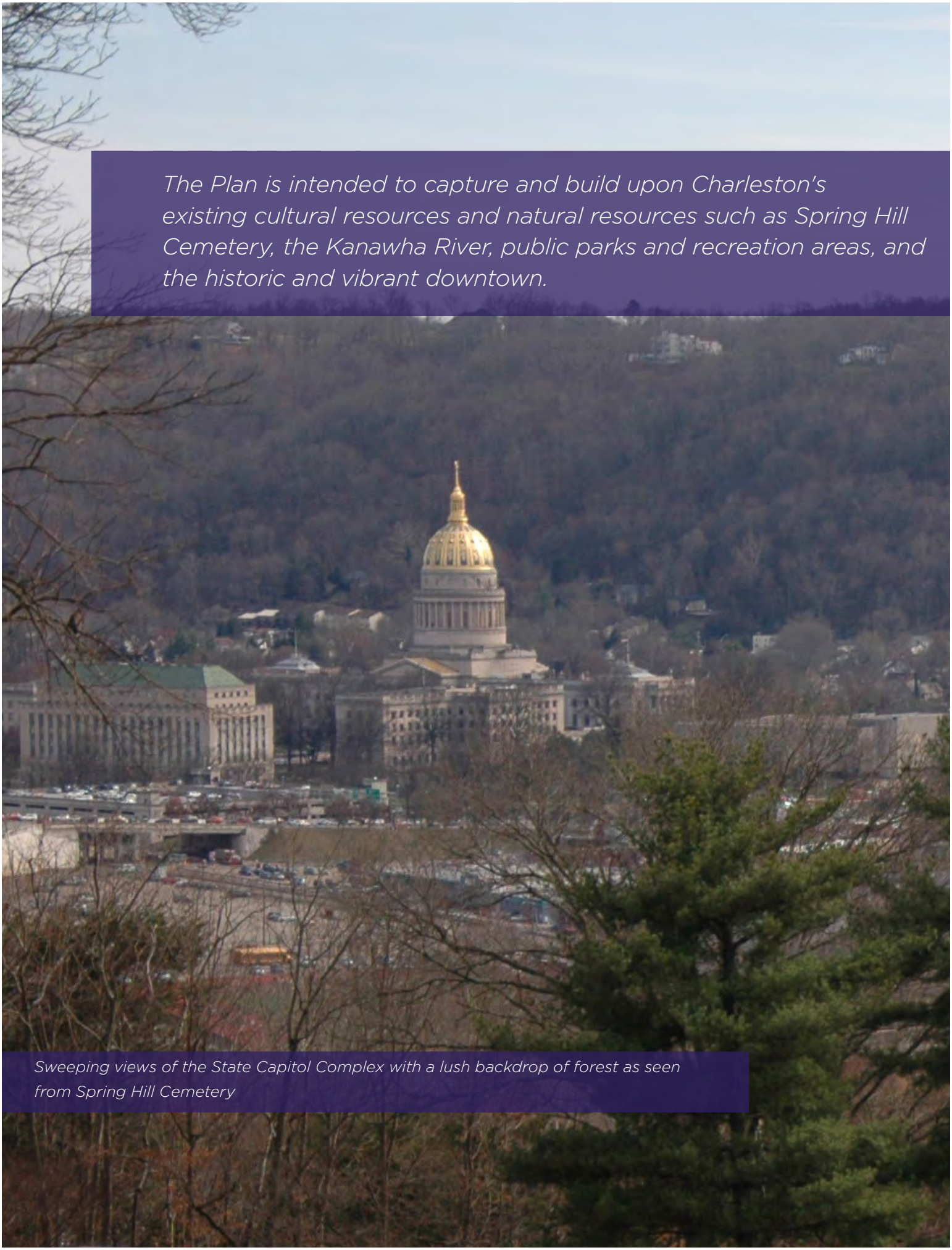
The Plan is intended to capture and build upon Charleston's existing cultural resources and natural resources such as Spring Hill Cemetery, the Kanawha River, public parks and recreation areas, and the historic and vibrant downtown.



Sweeping views of the State Capitol Complex with a lush backdrop of forest as seen from Spring Hill Cemetery

IV. IMPLEMENTATION PLAN & TOOLKIT

It requires really hard work to get beyond the dashboard view of our streets...The new blueprint is not anti-car. It is pro-choice.

-- Janette Sadik-Khan, Former NYC DOT Commissioner

Introduction

The long-term vision for bicycle transportation in Charleston has been set. Now the City and its partners must begin to implement the vision - *but where do we start?*

The following section answers this question and **presents project prioritization, project funding needs, and programs projects into a digestible capital improvements plan**. Also, **select top-priority projects are discussed in more detail** to help communicate potential needs and results of the first Plan projects implemented. Finally, **this section introduces other tools, such as funding resources, that will assist the City** of Charleston and it's partners in implementing Plan recommendations.

The City and its partners should use this section as a guide for achieving the vision and goals established in the beginning of the Plan. As a general strategy, the City and its partners should regularly evaluate how well recommendations are being met and whether these recommendations still meet the needs of Charleston's residents and visitors. The goals presented in the introduction of this plan also serve with specific benchmarks defined for infrastructure and non-infrastructure improvements. Implementation progress should be regularly tracked on at least an annual basis—an annual "state of bicycling" report is a good means of accomplishing this in a format that can be easily shared with the public to inform them on Plan progress. In addition, as best practices in bicycle and accommodation is a rapidly-evolving field, the recommendations in this plan should be re-evaluated at least every five years to ensure that these still constitute best-practices and still reflect Charleston's long-term vision for bicycling.

Prioritization

OVERVIEW

The network recommendations presented in the previous section show the long-term vision for the bicycling network. Achieving this vision will require political support; local advocacy; coordination with project partners such as WVDOH; and adequate, and preferably dedicated, funding to cover installation and long-term maintenance of facilities.

To help obtain the highest value on investment, meet Plan goals, and build support for improvements over time, both the pedestrian and bicycling network have been prioritized and divided into phases with the highest-priority projects being targeted for implementation first. The goal of prioritization is to ensure that improvements are distributed equitably, and that projects generating the greatest benefit while expending the least amount of resources are implemented first. Prioritization factors and weights are based upon feedback the project team received from the public and other key project stakeholders.

The City will conduct engineering studies on the top ten priority projects to determine their engineering feasibility.

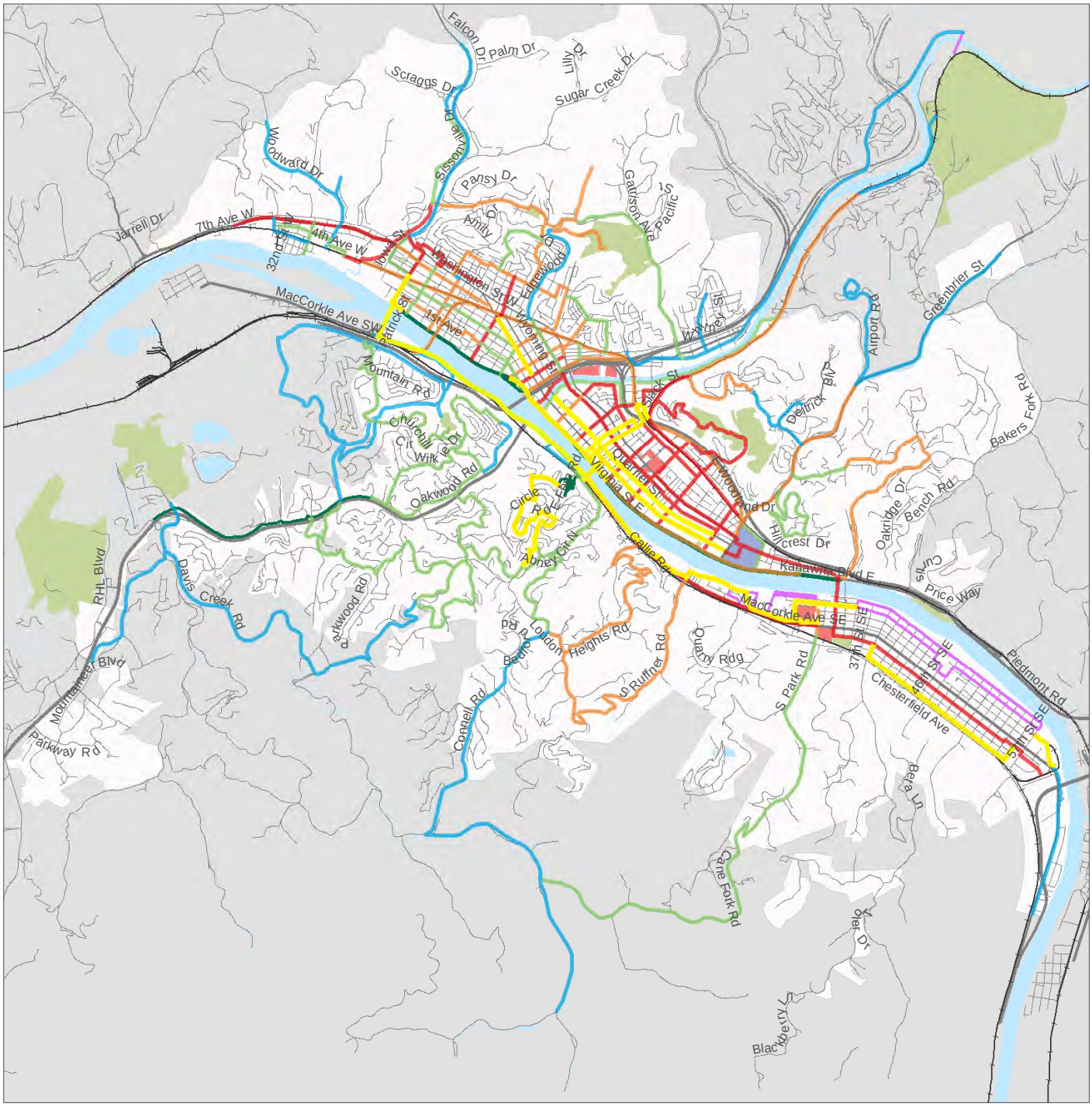
BICYCLE PRIORITIZATION METHODOLOGY

Bikeway network development utilized a number of different analyses, described in the Existing Conditions section of this plan, and planning judgment to determine what project types are warranted along roadways throughout Charleston. These recommendations also include off-street, shared-use path recommendations where they serve a major connectivity function in the network. The ultimate goal of the bikeway network is providing connectivity to destinations such as retail centers, job centers, schools and recreation opportunities for all residents.

Prioritization looked at similar considerations to determine the need, feasibility, and benefit of implementing all on-street and off-street recommendations. The project team developed prioritization criteria and collectively determined the importance of each consideration by assigning each category an appropriate weight. These weights can be seen in Table 4.1.

Table 4.1 Weighting Criteria for Project Prioritization

Criteria	Definition	Input	Score
Live, Work, Play, Learn	Does this project serve an area with high demand for bicycle facilities?	Composite Score from Live, Work, Play, Learn Analysis	1-5 pts. – score from Live, Work, Play, Learn Analysis
Schools	Does the project serve a local school?	Gives additional priority for projects within 1.5 miles of a school	1 pt. – w/in 1.5mi of one school 2 pts. – W/in 1.5 mi of two schools 3 pts. - w/in 1.5 mi of 3+ schools
Equity	Does the project serve disadvantaged communities?	Gives additional priority for census blocks with high poverty rates	1 pt. - 20-39% of households living below the poverty line 2 pts. – 40+% of households living below the poverty line
Public Input	Does the public support this project as a priority?	Online public input map	1 pt. – identified as a priority in public input wikimap
Ease of Implementation	How difficult will the project be to implement?	WVDOH roadways, facility type	1 pt. – local jurisdiction roadway 1 pt. – shared roadway recommendation (total of 2 pts. possible)
Connectivity Score	Does the project connect to other projects within an implementation phase?	Connectivity to other projects	1-4 pts. – depends on significance of network gap by project phase.



Charleston, WV Project Prioritization Overview

0 0.5 1 Miles

Top 10 Priority Projects

Prioritization Score

- 9 - 12 (Phase1)
- 8 (Phase 2)
- 6 - 7 (Phase 3)
- 2 - 5 (Phase 4)

Spot Improvements

- Bicycle/Pedestrian Cut-Through
- Crossing Improvements
- Intersection Improvements

Existing Facilities

- Bike Route
- Multi-Use Path

Areas of Interest

- Park
- City Boundary
- State Capitol
- Hospital / Med. Center

Project Phasing

CHARLESTON BICYCLE PROJECTS

Following scoring, projects were divided into phases with the highest scoring projects being included in earlier phases. Phase breaks follow breaks in prioritization score for bicycle projects, and are generally 30 to 40 mile phases for bicycle and shared-use path projects. A mileage and facility type summary of the top priority projects is provided in Table 4.2. Corridor details about each priority project can be found on the following page in Table 4.4. Table 4.3 shows recommended Charleston projects by phase.

Top priority projects were selected based on their prioritization score, and when complete will provide a base of all ages and abilities bicycle connectivity to all areas of Charleston, as well as a continuous loop around both sides of the Kanawha River.

Table 4.2 Summary of Top 10 Priority Projects

Facility Type	Miles
Bicycle Boulevard	8.10
Cycle Track	3.26
Shared Lane Markings	0.74
Shoulder Bikeway	1.13
Shared-Use Path	1.44
Total	**14.67 mi**

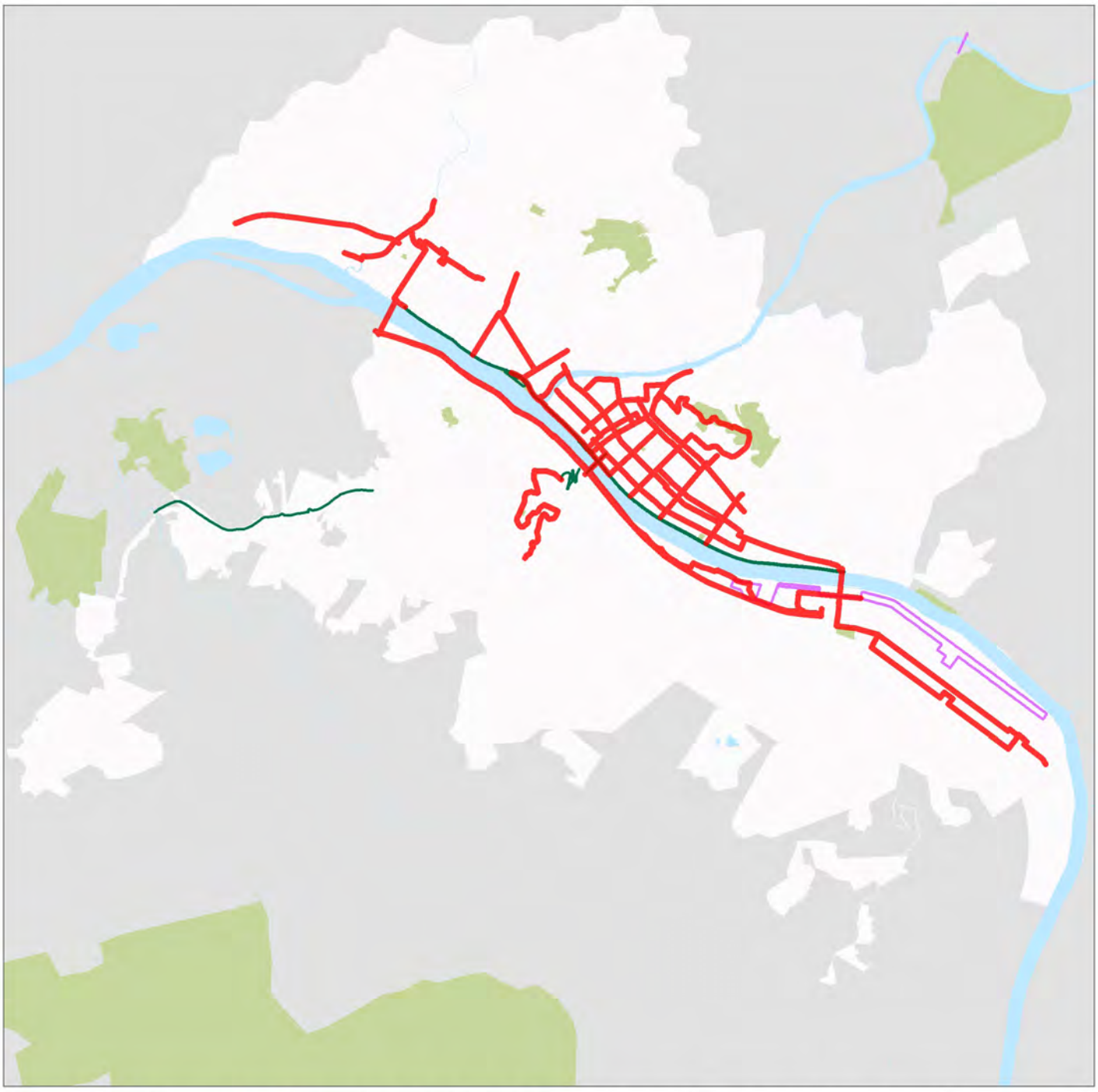
In addition, there are a number of bicycle spot intersection improvements, roadway crossing improvements, and cut-throughs recommended in this Plan as seen in the bicycle recommendations maps. These should be implemented in conjunction with the linear bikeway improvements they correspond to. Due to the wide variation in improvement types and subsequent costs, this Plan does not include cost estimates for these improvement types.

Table 4.3 Bikeway Projects by Phase

Phase 1 (Includes Top 10)	**46.08 mi**
Bicycle Boulevard	22.57
Bike Lane	4.35
Bike Route	0.50
Buffered Bike Lane	1.43
Cycle Track	5.27
Greenway Trail	0.39
Rail-with-Trail	1.15
Shared Lane Markings	1.64
Shared-Use Path	3.05
Shoulder Bikeway	5.73
Phase 2	**29.55 mi**
Bicycle Boulevard	14.27
Bike Lane	2.39
Bike Route	3.86
Buffered Bike Lane	0.47
Cycle Track	2.79
Rail-with-Trail	3.36
Shared Lane Markings	0.66
Shoulder Bikeway	1.75
Phase 3	**38.93 mi**
Bicycle Boulevard	18.72
Bike Lane	3.87
Bike Route	11.39
Cycle Track	0.98
Shared Lane Markings	0.35
Shared-Use Path	3.62
Phase 4	**29.17 mi**
Bicycle Boulevard	5.90
Bike Lane	1.72
Bike Route	8.89
Bike/Ped Cut-Through	0.08
Buffered Bike Lane	2.78
Cycle Track	1.28
Shared Lane Markings	0.06
Shared-Use Path	5.53
Shoulder Bikeway	2.93

Table 4.4 Top 10 Priority Projects (order of projects not indicative of importance)

Corridor	From	To	Recommendation	Miles	Cost Estimate (Low)	Cost Estimate (High)
Virginia St. W	Tennessee Ave.	Park Ave.	Two-Way Cycle Track	.58	$99,00000	$150,000
Quarrier St.	Elk River Trail at Civic Center	Elizabeth St.	Two-Way Cycle Track (riverfront trail to Summers Street), Shared Lane Markings (Summers St. to Morris St.) Bicycle Boulevard (Morris St. to Elizabeth St.)	1.7	$88,600	$139,500
Kanawha Avenue Bike Route; Kanawha Landing; Lancaster Avenue	n/a	n/a	Bicycle Boulevard upgrade to existing bike route; bicycle boulevard through Kanawha Landing; Shared-Use Path on Lancaster Ave. with bicycle boulevard spurs.	5.81	$993,200	$1,214,900
MacCorkle Ave.	Frontage Rd.	Thayer St.	Shoulder Maintenance Improvements	1.1	n/a	n/a
Myrtle Rd. - Laurel Rd. - Oakmont Rd. - Walnut Rd. - Bridge Rd	Carriage Trail	Moore Rd.	Bicycle Boulevard	1.9	$19,400	$38,600
Kanawha Blvd.	Leon Sullivan Way	Magic Island	Cycle Track/Sidepath	1.2	$2,020,900	$2,020,900
South Side Bridge	Ferry St.	Virginia St.	Priority Shared Bike Lanes ("Green-Backed Sharrows" and signage)	0.25	$2,700	$5,200
Capitol St./ Summers St.	Kanawha Blvd.	Smith St.	Bicycle Boulevard (Christopher St. acts as connection between Capitol St. and Summers St.)	1.1	$23,400	$40,900
Capitol Market to Slack St. via Piedmont Rd. and Court St.	Capitol St.	Slack St.	Two-Way Cycle Track	0.34	$58,100	$88,000
Kanawha Blvd. - Patrick St.	North Fork in Roadway	5th Ave.	Separated Two-Way Cycle Track	0.7	$115,500	$175,100



Charleston, WV Project Prioritization - Phase 1

0 0.5 1 Miles

Network Prioritization

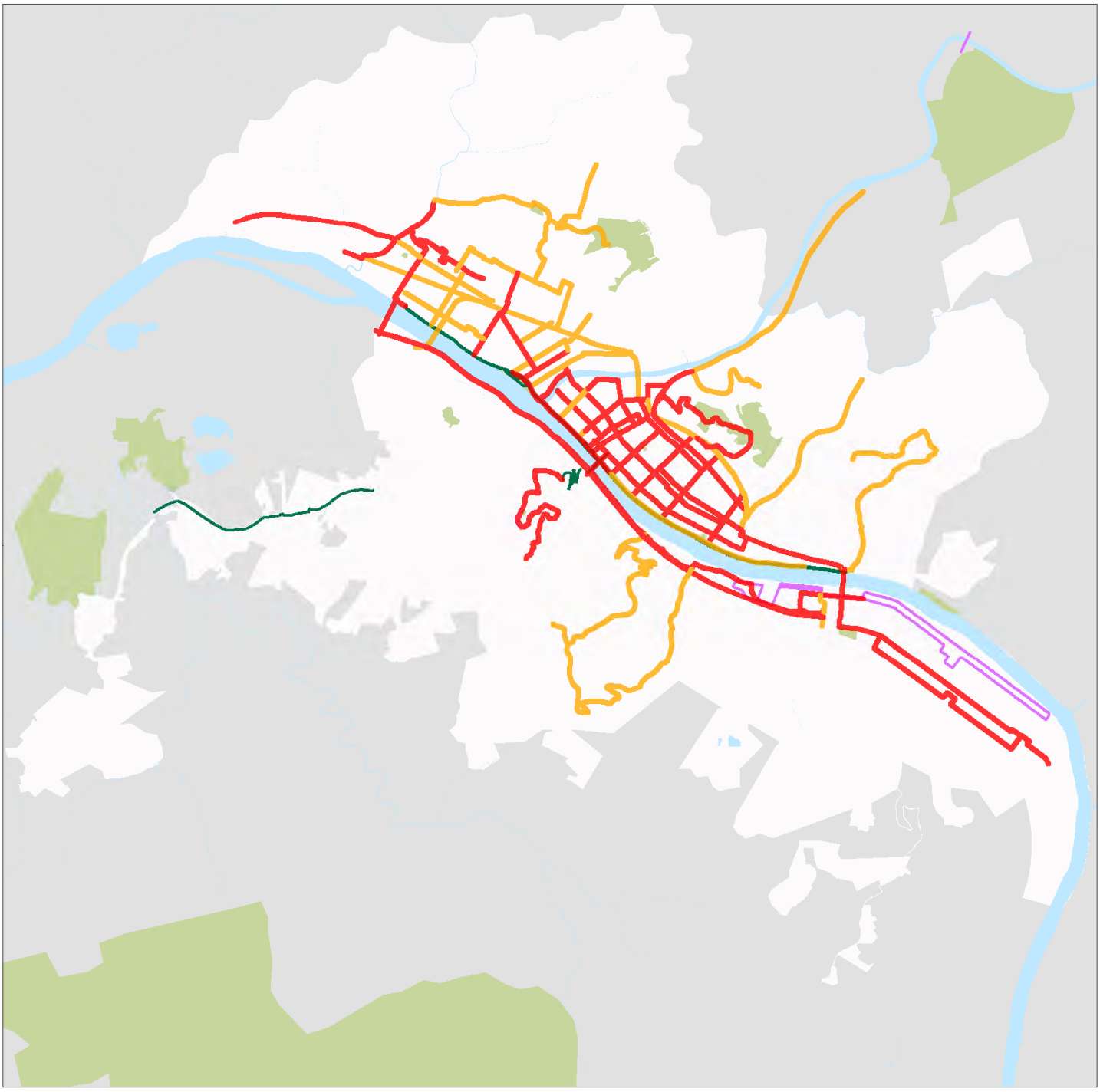
- Phase 1

Existing Facilities

- Bike Route
- Multi-Use Path

Areas of Interest

- Park
- City Boundary



Charleston, WV Project Prioritization - Phase 2

0 0.5 1 Miles

Network Prioritization

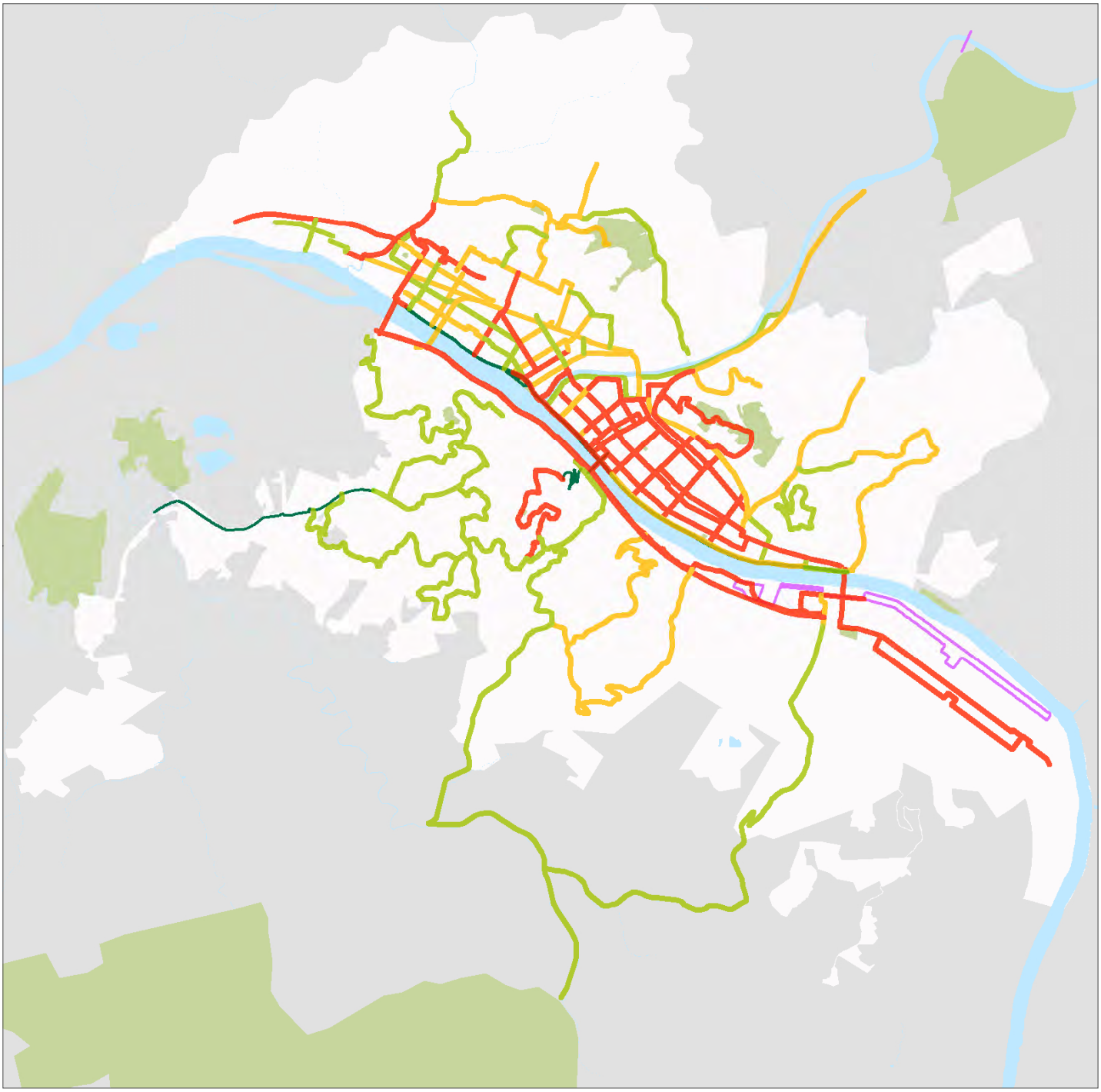
- Phase 1
- Phase 2

Existing Facilities

- Bike Route
- Multi-Use Path

Areas of Interest

- Park
- City Boundary



Charleston, WV Project Prioritization - Phase 3

0 0.5 1 Miles

N

Network Prioritization

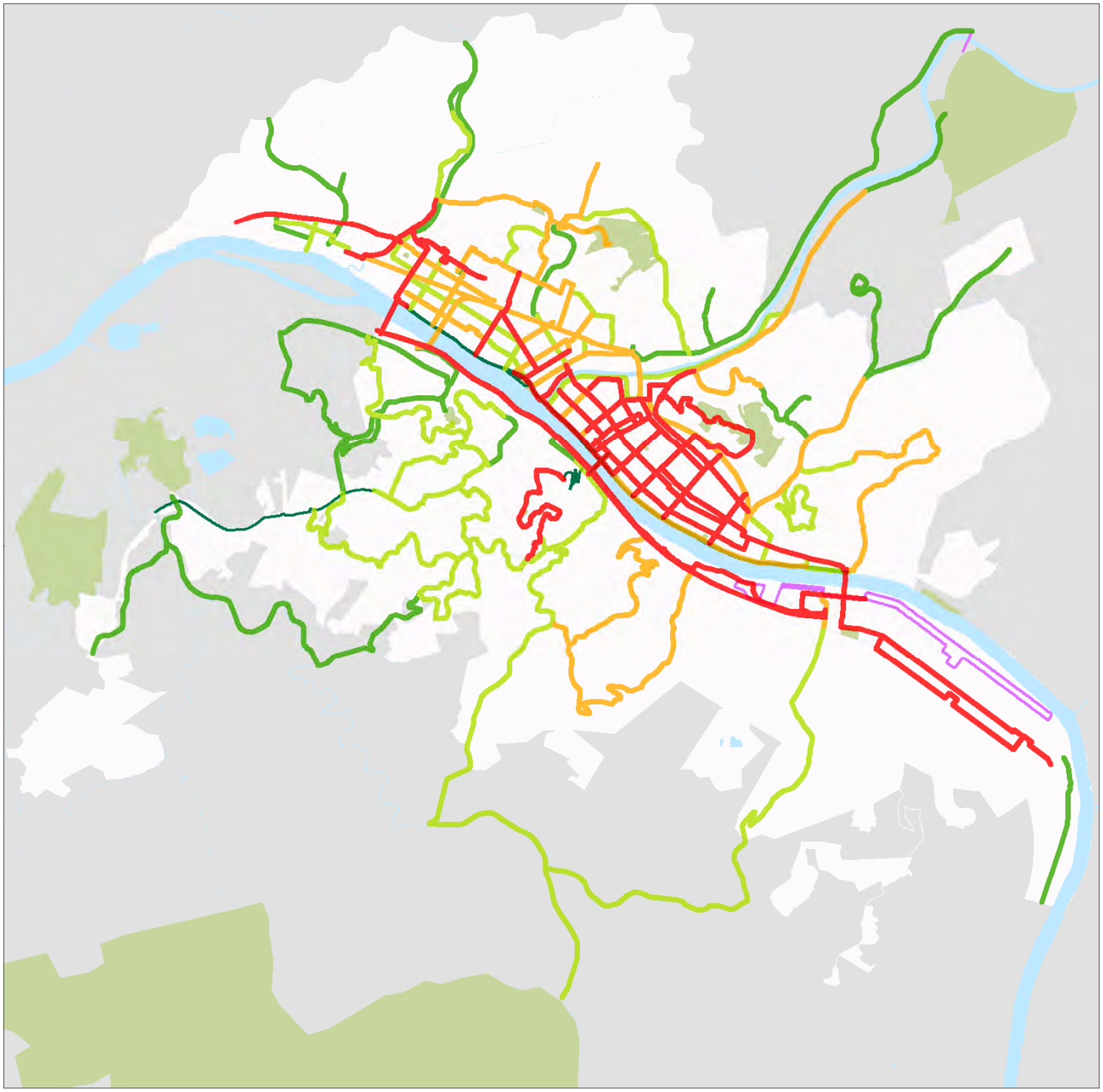
- Phase 1
- Phase 2
- Phase 3

Existing Facilities

- Bike Route
- Multi-Use Path

Areas of Interest

- Park
- City Boundary



Charleston, WV Project Prioritization - Phase 4

0 0.5 1 Miles

Network Prioritization

- Phase 1
- Phase 2
- Phase 3
- Phase 4

Existing Facilities

- Bike Route
- Multi-Use Path

Areas of Interest

- Park
- City Boundary

Project Cost Estimates

COST ESTIMATE METHODOLOGY

Cost estimates for projects were derived from current, typical construction costs in the region. While these costs represent averages for pedestrian and bicycle projects in 2014 dollars, note that individual project costs can vary widely based on a number of conditions including, but not limited to:

- Facility design (width, frequency of material placement, demolition)
- Temporary traffic control requirements
- Environmental requirements
- Utility relocation
- Required right of way acquisition
- Contractor experience and material availability
- Project length or grouping (projects of longer length are typically less expensive than short projects).

Project cost estimates consider the facility type, implementation strategy, and include soft costs such as traffic control, design, and construction management. The project team developed low and high cost estimates to account for the variation in construction materials and implementation strategies that can be employed in developing bikeway projects. For example, installing a bike lane utilizing paint will have substantially less initial installation cost than reflective thermoplastic (however, thermoplastic will require less maintenance in the long-term). A breakdown of these complete cost estimate components and assumptions were provided to the City to utilize as a tool in implementing bikeway projects.

Project cost estimates do not include long-term maintenance. This plan's design guidelines (Appendix E) provide information on regular maintenance activities that are required as part of an effective bikeway network. As the bikeway network grows and ages in Charleston, the City will need to dedicate funds for regular bikeway maintenance activities such as restriping, sweeping, and snow removal.

Table 4.5 provides a summary of project costs by phase.

Priority Project Cutsheets

As a part of this planning effort, the project team developed project cutsheets for the top 10 priority projects within Charleston. These cutsheets are presented on the following pages and can be utilized for a variety of uses, such as to convey what improvements will potentially look like to residents and stakeholders, as well as assist in applying for grant money to fund implementation.

Table 4.5 Cost estimate by phase

Project Phase	Sum of Costs (Low)	Sum of Costs (High)
Top 10 Projects	$3,420,800	$3,873,100
Phase 1 (Includes Top 10)	$6,437,900	$7,988,600
Phase 2	$6,798,900	$7,937,800
Phase 3	$3,062,200	$4,131,300
Phase 4	$5,167,700	$7,020,500
Total	**$24,887,500**	**$30,951,300**

VIRGINIA STREET WEST

TWO-WAY CYCLE TRACK

Project Mileage: 0.58 miles **Avg. Daily Traffic:** 5,081

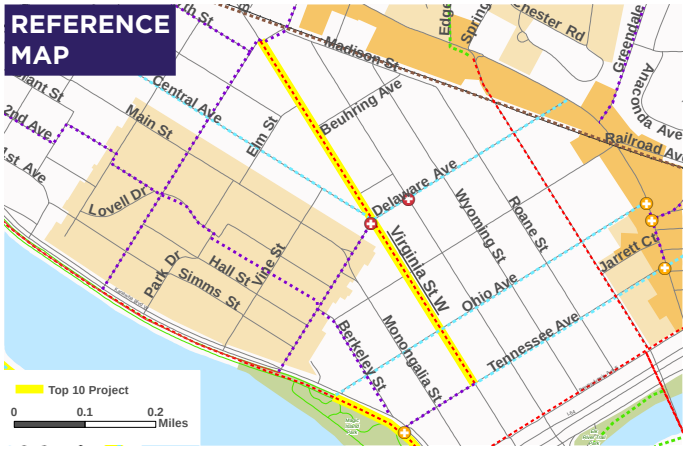
Cost Summary: $99,000 (low cost estimate), $150,000 (high cost estimate)

Project Highlights: The two-way cycle track on Virginia Street will provide a seamless "all ages and abilities" bicycle connection through north Charleston to proposed facilities that connect to downtown, the riverfront, a rail trail, and historic and commercial nodes.

Key Issues: Currently, there is no bicycle connectivity along Virginia St. The wide lanes and long, straight roadway encourage speeding making this an unsafe and uninviting corridor for bicyclists and pedestrians.

Proposed Improvements: Two-way cycle track from Park Avenue to Tennessee Avenue.

Implementation Strategy: Existing conditions indicate that a two-way cycle track could be implemented by either re-purposing one travel lane (shown below), or removing parking from one side of the street. Dedicated turn bays would likely maintain acceptable vehicular traffic flow if the number of lanes is reduced. Minor parking removal or conversion to a one-way road west of Central Ave. would provide roadway space to continue cycle track.



QUARRIER STREET

TWO-WAY CYCLE TRACK + BIKE BOULEVARD

Project Mileage: 1.7 miles **Avg. Daily Traffic:** 5,390

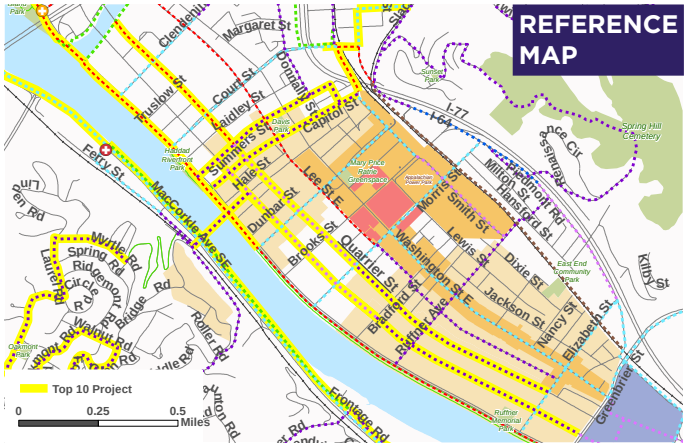
Cost Summary: $88,600 (low cost estimate), $139,500 (high cost estimate)

Project Highlights: The two-way cycle track on Quarrier St. will provide a seamless bicycle connection from the Civic Center into the heart of downtown. The shared lane markings and bicycle boulevard sections of Quarrier St. will link adjacent neighborhoods to downtown.

Key Issues: Coupled with the improvements on Virginia Street East, these facilities create a well-connected network through downtown and to key nearby destinations which were previously isolated or unsafe and uninviting to reach by bike.

Proposed Improvements: Project extents are from Elk River Trail at the Civic Center to Elizabeth Street. The cycle track extends from the riverfront trail to Summers Street. It then continues as a shared lane marking until Morris Street, and then a bicycle boulevard until Elizabeth Street. Further study required at the intersection with Summers St.

Implementation Strategy: The cycle track would repurpose one vehicular travel lane as a bi-directional bikeway along the one-way street. The cycle track should be maintained to be free of debris and broken pavement.



REFERENCE MAP


BIKE BOULEVARD WITH GREEN-BACK SHARROW EXAMPLE

QUARRIER STREET IMPROVEMENTS


EXISTING

KANAWHA AVENUE BIKE ROUTE

BIKE BOULEVARD UPGRADE + SHARED-USE PATH

Project Mileage: 5.81 miles **Avg. Daily Traffic:** Unknown

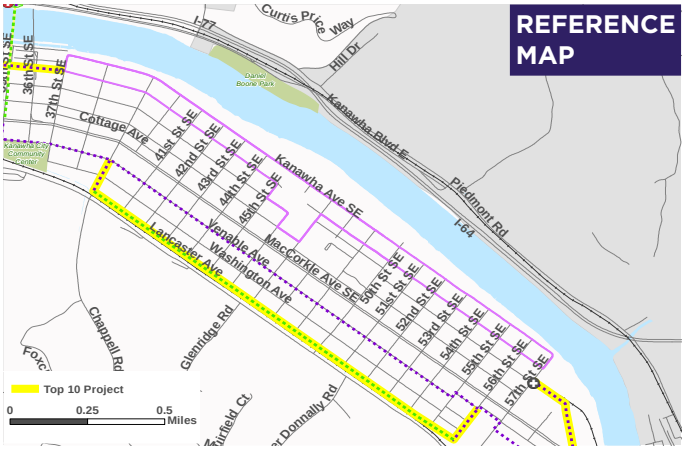
Cost Summary: $993,200 (low cost estimate), $1,214,900 (high cost estimate). Traffic calming features would add to these costs.

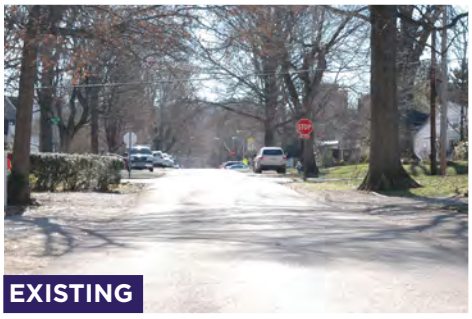
Project Highlights: The existing bike route offers connections to the proposed bicycle boulevard and trail on Lancaster Ave., as well as to the 35th St. bridge and proposed cycle track on MacCorkle Ave.

Key Issues: The existing bike route is in need of investments and improvements to create a more accessible bicycle boulevard. This can connect residents to healthcare centers and retail and employment destinations, such as state offices and grocery stores.

Proposed Improvements: Upgrade the existing bike route to a bicycle boulevard. Create a bicycle boulevard through Kanawha Landing. Create a trail on Lancaster Avenue with bicycle boulevard spurs on 39th St. and 56th St. to connect to adjacent proposed facilities.

Implementation Strategy: Bicycle boulevard improvements include bicycle/pedestrian cut-throughs, wayfinding signage and pavement markings, and may also include traffic calming devices to reduce cut-through traffic. The city should coordinate with property owners for the bike/ped cut-throughs.





MACCORKLE AVENUE

SHOULDER IMPROVEMENTS

Project Mileage: 1.1 miles **Avg. Daily Traffic:** 26,582

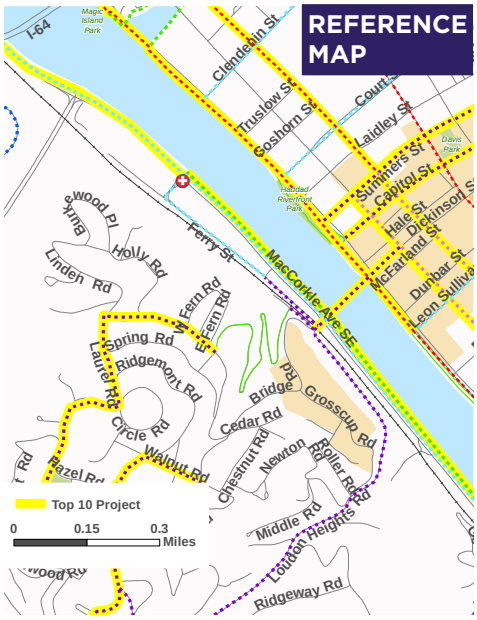
Cost Summary: Near-term cost estimate dependent on typical local maintenance costs; long-term cost estimate requires engineering study

Project Highlights: Creates route along Kanawha River linking downtown and University of Charleston by way of riverfront. Includes cantilevered, separated path recommended in previous bike/ped corridor study. Regularly programmed maintenance serves interim need.

Key Issues: Shoulder maintenance is a frequently cited issue among bicyclists. High traffic speed and volume make this an undesirable route for average cyclists.

Proposed Improvements: Project extents are from Frontage Road to Thayer Street. Near-term improvements should prioritize maintenance, including regular sweeping and plowing of shoulder.

Implementation Strategy: Coordinate with WVDOH to regularly maintain shoulder area and provide signage to




MACCORKLE AVENUE IMPROVEMENTS - SHORT TERM


EXISTING

Long-term improvements reference a previously conducted WVDOH/City of Charleston feasibility study looking at the potential of a shared-use path off of the existing roadway shoulder. The study determined that a separated path would indeed be feasible from an engineering standpoint. A separated pathway would provide a bicycling and walking environment comfortable for users of all ages and abilities.


MACCORKLE AVENUE IMPROVEMENTS - LONG TERM

BRIDGE ROAD TO CARRIAGE TRAIL

BIKE BOULEVARD

Project Mileage: 1.9 miles **Avg. Daily Traffic:** 4,000

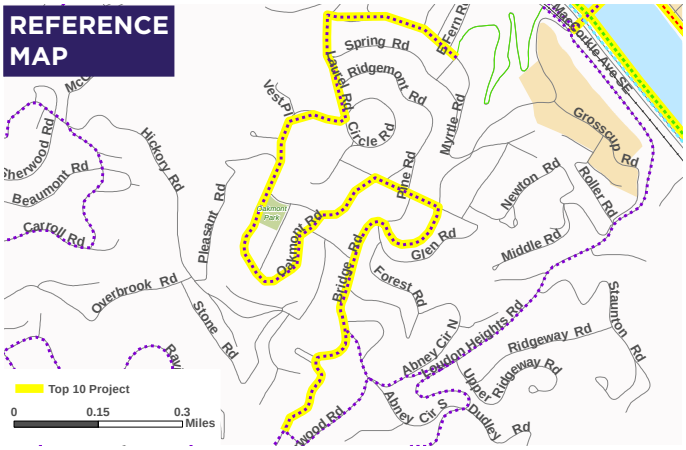
Cost Summary: $19,400 (low cost estimate), $38,600 (high cost estimate). Traffic calming features would add to these costs.

Project Highlights: Links neighborhood to business district and connects to proposed bicycle improvements over South Side Bridge to downtown Charleston.

Key Issues: A circuitous steep and narrow roadway network characterized by this part of town makes finding a comfortable bicycling route to preferred destinations difficult. Bicycle boulevards would help dedicate and define a comfortable bicycling route to nearby retail and downtown Charleston.

Proposed Improvements: Proposed route follows Myrtle Rd. - Laurel Rd. - Oakmont Rd. - Walnut Rd. - Bridge Rd. from the Carriage Trail to Moore Rd.. Improvements include wayfinding signage, pavement markings, and may also include traffic calming devices where needed to address speeding.

Implementation Strategy: Install shared-lane pavement markings and signage to guide cyclists to local and citywide destinations.




BIKE BOULEVARD EXAMPLE


EXISTING

BRIDGE ROAD TO CARRIAGE TRAIL IMPROVEMENTS

KANAWHA BOULEVARD

TWO-WAY CYCLE TRACK/SHARED-USE PATH

Project Mileage: 1.2 miles **Avg. Daily Traffic:** 14,120

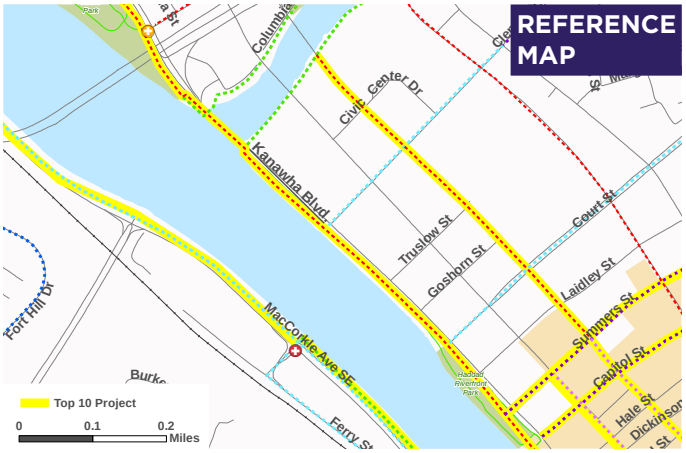
Cost Summary: $2,020,900 (based on cost of section north of Magic Island, does not include cost of connection across Elk River)

Project Highlights: The path upgrades along Kanawha Boulevard north of Magic Island will provide a great amenity for residents traveling and recreating along the river. This recommendation proposes continuing this facility south of Magic Island using the existing bridge structure at Elk River.

Key Issues: The current path is unsafe for bicycle travel and should be upgraded to meet current guidelines for bicycle paths separated from the roadway.

Proposed Improvements: Two-way cycle track with adjacent pedestrian path (16′ minimum) or shared-use path/sidepath (12′ minimum).

Implementation Strategy: Use the existing Kanawha Boulevard bridge structure across the Elk River to create a shared-use path along one side. Utilize similar design to that of improvements north of Magic Island.



Previously Proposed Improvements to Kanawha Boulevard North of Magic Island

EXISTING

KANAWHA BOULEVARD IMPROVEMENTS

SOUTH SIDE BRIDGE

PRIORITY SHARED BIKE LANES

Project Mileage: 0.25 miles **Avg. Daily Traffic:** 13,729

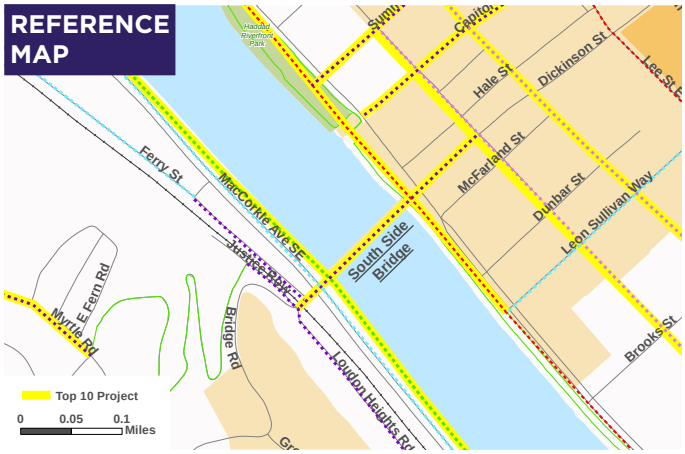
Cost Summary: $2,700 (low cost estimate), $5,200 (high cost estimate)

Project Highlights: These improvements would provide a more bike-friendly connection across the Kanawha River to the Carriage Trail and neighborhoods south of the river.

Key Issues: Bicycle connectivity across rivers is difficult in Charleston. Being a City-jurisdiction bridge, with relatively low traffic volumes and speeds, the South Side bridge offers an opportunity to provide a comfortable, low-cost connection for bicyclists wanting to connect to and from downtown across the Kanawha River.

Proposed Improvements: Project extents are from Virginia St. to Ferry St.. Outside vehicular lanes will become "priority bicycle lanes" by adding green-backed shared-lane markings in center of the lanes, bicycles may use full lane signage, and wayfinding signage. It is also recommended that the speed limit across the bridge be reduced from 30mph to 25mph.

Implementation Strategy: Add shared-lane markings and signage along bridge deck and approaches.



In the long-term, when the bridge is reconstructed, the City should delineate a separated on-road or off-road bikeway.

CAPITOL ST/SUMMERS ST

BIKE BOULEVARD

Project Mileage: 1.1 miles **Avg. Daily Traffic:** 4,000

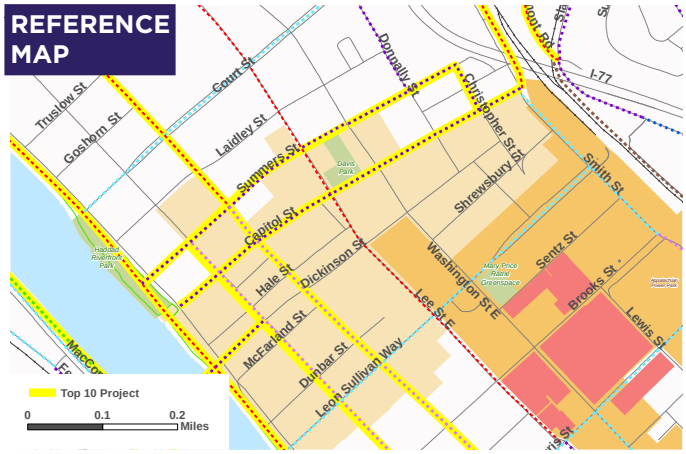
Cost Summary: $23,400 (low cost estimate), $40,900 (high cost estimate)

Project Highlights: Designated bicycle boulevard through heart of downtown core, provides connection to the Kanawha River, Capitol Market, and many desirable destinations in-between.

Key Issues: While the corridor is currently fairly walk- and bike-friendly, wayfinding signage, shared-lane markings, and traffic calming can help reinforce the message that bicyclists are welcome downtown and guide people on bikes to important downtown destinations.

Proposed Improvements: Project extents create a horshoe loop from Kanawha Blvd. to Smith Street using one-way bicycle boulevards on Capitol St. and Summers St. Add wayfinding signage, bikes may use full lane signs, and shared-lane markings to enhance these corridors for bicyclists. Pedestrian improvements such as high-visibility crosswalks will also make this corridor safer for all non-motorized users.

Implementation Strategy: Northbound bike boulevard on Capitol St. connecting to Summers St. southbound bike boulevard via Christopher St. Add green-backed shared-lane markings on right-most lanes and aforementioned enhancements.



CAPITOL MARKET TO SLACK STREET

TWO-WAY CYCLE TRACK

Project Mileage: 0.34 miles **Avg. Daily Traffic:** 7,417

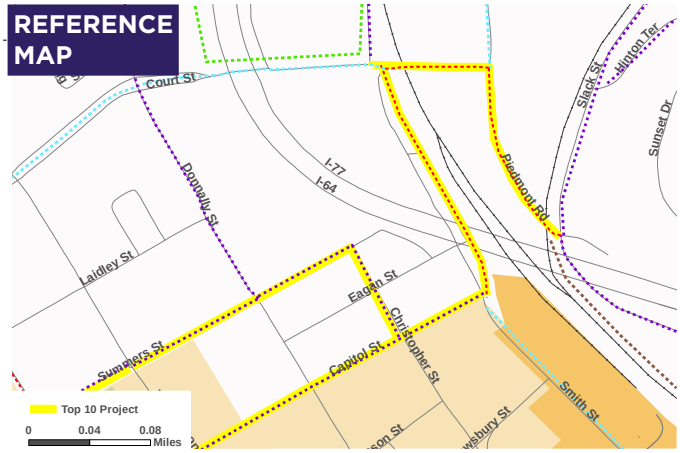
Cost Summary: $58,100 (low cost estimate), $88,000 (high cost estimate)

Project Highlights: This project would join downtown and Capitol Market to previously disconnected residential and commercial space northeast of the railroad and highway. The project would also provide a connection to Coonskin Park via the Barlow Drive bicycle boulevard or proposed riverfront trail project.

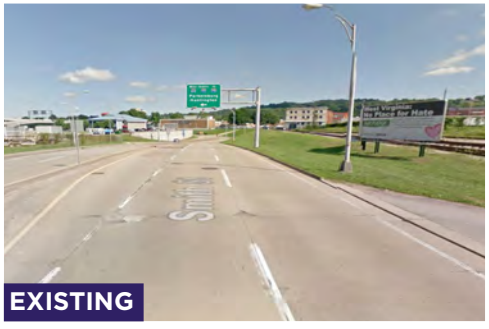
Key Issues: Overcoming physical barriers like large, uncomfortable roadways between downtown and the areas to the northeast, the elevated highway, and railroad tracks.

Proposed Improvements: Two-way cycle track from Capitol Street at Smith Street to Court Street; Court Street to Piedmont Road; and Piedmont Road to Slack Street.

Implementation Strategy: Utilize excess pavement for two-way cycle track. Include wayfinding to direct cyclists to nearby key destinations. Use colored pavement at driveway entrances, through intersections, and other potential conflict zones. Include a verticle separation element like bollards.




TWO-WAY CYCLE TRACK EXAMPLE


EXISTING

CAPITOL MARKET TO SLACK STREET IMPROVEMENTS

KANAWHA BLVD/PATRICK ST

TWO-WAY CYCLE TRACK

Project Mileage: 0.7 miles **Avg. Daily Traffic:** ~15,000

Cost Summary: $115,500 (low cost estimate), $175,100 (high cost estimate) (includes bicycle improvements only)

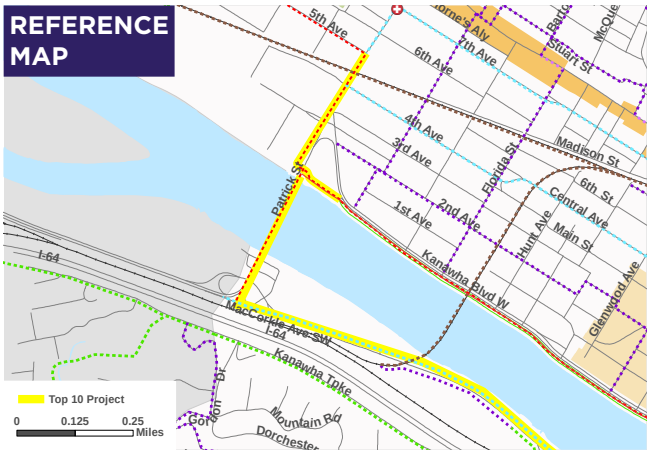
Project Highlights: This improvement would extend the cycle-track connection currently programmed for construction along Kanawha Blvd. This provides crossing improvements for pedestrians and bicyclists trying to access Patrick St. retail destinations.

Key Issues: Patrick St. is a very difficult corridor for bicyclists and pedestrians to access, but important due to the adjacent retail and connectivity to northernmost Charleston neighborhoods.

Proposed Improvements: Separated two-way cycle track along Patrick St. from the north fork in Kanawha Blvd. to 5th Ave.

Implementation Strategy: A two-way cycle track on the north side of the roadway through the existing retail parking lot adjacent to the road via land acquisition (shown). This preserves the existing lane configuration. A separate or cantilevered bridge structure will be required to cross the Kanawha River if the 4-lane roadway cross-section is maintained. The south/eastbound one-way segment of Kanawha Blvd. has adequate existing width to restripe and include a two-way cycle track connecting to the programmed off-street path along Kanawha Blvd.

For Further Study: Reducing Patrick St. to 2 through lanes would allow a cycle-track to extend across the river, utilizing the existing bridge deck. A center turn lane would be included east of the bridfge.



Implementation Strategies and Tools

OVERVIEW

The bicycle facility types presented in the network recommendations are considered the most appropriate facility types for the conditions observed. Considerations when selecting facility types included feasibility of implementation, intended user groups, current traffic and physical conditions, public input, and extensive site observations. While the City of Charleston and its implementing partners should strive to implement the network as it is presented herein, other unforeseen constraints may prevent this from being possible in all cases. **If unforeseen constraints prevent the recommended facility type from being feasible, the implementing agency should strive to implement the next best facility type in terms of user separation and safety.** For example, if cycle tracks are not feasible on a section of roadway, buffered bike lanes should be installed as an alternative treatment.

Similarly, the City and its partners should strive to follow project prioritization for implementing plan recommendations, as each phase was strategically developed to add an additional layer to the citywide bicycle network. However, the implementing agency should also **look for opportunities to coordinate bikeways construction with regularly-programmed maintenance activities**, even if this results in projects being implemented outside of their scheduled phasing. Coordinating with resurfacing and re-engineering projects that are already programmed through City of Charleston, County, or WVDOH maintenance will greatly reduce the costs of implementing recommended facilities in most cases.

The majority of corridors selected in this Plan have the potential to become Complete Streets - streets designed and operated to enable safe access for all road users of all ages and abilities. Thus, in addition to aligning bikeway construction with maintenance activities, the implementation agency should also **use this opportunity to concurrently integrate pedestrian improvements, particularly at intersections.** Fundamental intersection improvements for pedestrians include curb ramps and ADA-compliance, high-visibility crosswalks, and pushbuttons and pedestrian signal heads.

Pedestrian routes in Charleston largely mimick the proposed bikeway network. However, **Charleston should consider to develop a pedestrian-specific plan** to address infrastructure and connectivity shortcomings, and plan for the City's walkable future.

The following sections provide an overview of several resources, developed as part of this planning effort, **that can be used to assist in the implementation of bikeways throughout Charleston**.

DESIGN GUIDELINES

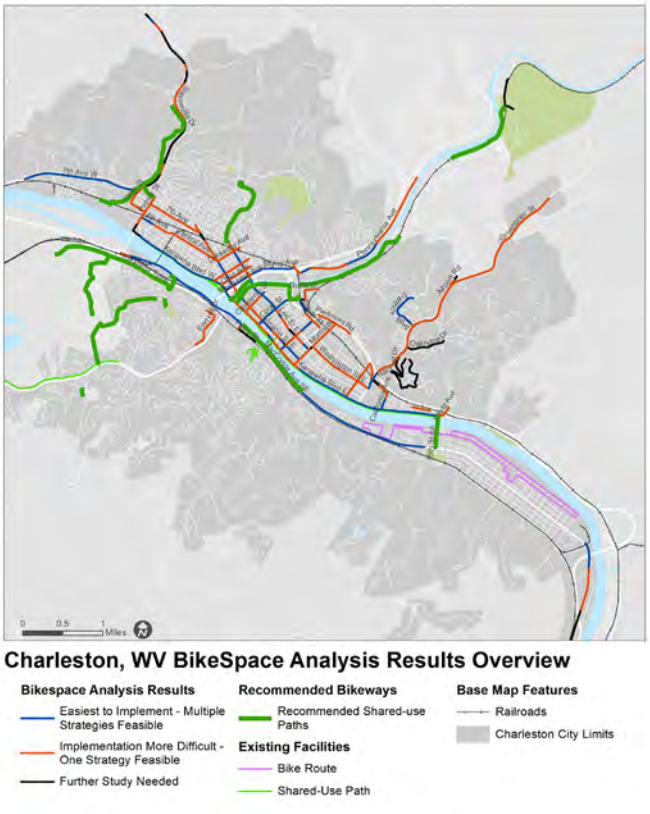
The project team developed bikeway design guidelines, consistent with both current best practices being implemented in major cities across the country, as well as nationally accepted standards and guidelines, such as the Manual of Uniform Traffic Control Devices (MUTCD), the American Association of State Highway Transportation Officials (AASHTO) Guide for the Development of Bicycle Facilities, and the National Association of City Transportation Officials (NACTO) Urban Bikeway Design Guide. City of Charleston and WVDOH project designers can use this resource as a tool for implementing the recommendations in this Plan.

The design guidelines are included in this document as Appendix E.

Below: Excerpt from the Charleston Bicycle Design Guidelines in Appendix E.

BIKESPACE ANALYSIS

The Bike Space Analysis is an Alta Planning + Design tool that determines the feasibility and potential implementation strategies for separated bikeways based on available roadway data such as width, configuration, and traffic volumes. This tool was utilized in the recommendations development, but can also be used by City of Charleston and WVDOH designers in determining what implementation strategy is the most appropriate for recommended projects. A summary of the Bike Space analysis and results can be found in Appendix C. A full, detailed table of the Bike Space analysis results was provided to the City as an internal reference.



Above: Thumbnail map of the Charleston BikeSpace analysis results.

Corridors that are human-scaled and oriented for more than just the car offer a sense of safety for bicyclists. Providing amenities like bicycle parking also entices bicyclists to stay and enjoy Charleston's lively commercial core.

A recumbent cyclist rides along Capitol Street, taking in the rich, historic streetscape.

V. APPENDICES

Livability means being able to take your kids to school, go to work, see a doctor, drop by the grocery or post office, go out to dinner and a movie, and play with your kids at the park - all without having to get in your car.

-- Ray LaHood, Former Unites States Secretary of Transportation

Introduction

This section contains all supplemental material supporting the Plan. The order of the appendices follow the progression of the Plan's development, including resources for next steps. This chapter is organized to include:

- Review of Existing Plans
- Citizen Comment Form
- BikeSpace Analysis
- Potential Funding Sources
- Bikeway and Trail Design Guidelines

Appendix A - Review of Existing Planning Efforts

INTRODUCTION

This section provides a summary of bicycle and trail planning-related efforts in Charleston, West Virginia and surrounding communities that have connecting routes into Charleston. The ten plans reviewed for this Plan are listed in *Table A.1* and described below.

Table A.1 The review included an assessment of existing bicycle-trail planning documents

Plan	Agency	Year
East End Community Renewal Plan	City of Charleston Planning Department & Charleston Urban Renewal Authority (CURA)	2005; amended 2012
Charleston Riverfront Master Plan	City of Charleston, WV	2006
Greater Charleston Greenway Initiative	West Virginia Land Trust	2006
West Side Community Renewal Plan	City of Charleston Planning Department & Charleston Urban Renewal Authority (CURA)	2008; amended 2014
Bicycle and Pedestrian Plan for Kanawha and Putnam Counties	Regional intergovernmental council	2008
Master Plan for Pedestrian and Bicycle Trail Corridors	City of South Charleston, WV	2011
Imagine Charleston - Comprehensive Plan	City of Charleston, WV	2013
Imagine Charleston - Downtown Redevelopment Plan	City of Charleston, WV	2013
Kanawha City Corridor Study	City of Charleston, WV	2013
Kanawha Trestle and Rail Trail Master Plan	City of Charleston, WV	2013

SUMMARY OF RELEVANT PLANNING EFFORTS

BICYCLE AND PEDESTRIAN PLAN FOR KANAWHA AND PUTNAM COUNTIES

The *Bicycle and Pedestrian Plan for Kanawha and Putnam Counties* is a two-phase study that identifies bicycle and pedestrian deficiencies within the existing transportation network and develops potential improvements for select corridors. The plan is divided into three sections which includes existing conditions, a needs assessment based on an analysis of existing conditions, and recommendations and next steps. Recommendations include:

- 6 ft bicycle lanes on MacCorkle Avenue (P. 19)
- Sharrows on MacCorkle – Patrick Street to 35th Street (P. 21)
- Sharrows on Washington Street East – 35th Street Bridge to Elk River (P. 26)
- Bike route on Washington Street West – River to Big Tyler Road (P. 27)
- Shared use path on Kanawha Boulevard – 35th Street to Daniel Boone Park (P. 28)
- Convert Kanawha River Trestle Trail to ped and bike crossing (P. 29)
- Shared use path on Edgewood Drive – Washington Street West to Wood Street (P.38)
- Shared use path on Oakwood Road – US 119 to Bridge Road (P.39)
- Shared use path on Davis Creek Road – US 119 to Kanawha State Forest (P. 40)
- Short term, minor improvements to roadway network (P. 59)

CHARLESTON RIVERFRONT MASTER PLAN - 2006

The *Charleston Riverfront Master Plan* provides a vision for the Kanawha River and how it can be a catalyst for improving quality of life, increasing private investment, and contribute to the economic success and revitalization of the city. The plan recommendations revolve around the design principles of creating additional park space, better integrating the city with the river, enhancing recreational and cultural qualities, enhancing areas for special events on the river, and spurring adjacent economic development in the city. Recommendations include:

- Widening the upper level and lower level pathways so they become more accessible and multipurpose (P. 39)
- Connect Magic Island to the Elk River Bridge and Haddad Riverfront Park. This includes implementing a road diet on the Elk River Bridge and upgrading the pedestrian and bicyclists space with additional ROW and amenities (P. 39, P. 53)

GREATEST CHARLESTON GREENWAY INITIATIVE - 2006

The Greater Charleston Greenway Initiative was established to gauge and organize community feedback on greenspace and trail topics. The report profiled Kanawha City, South Hill, and South Charleston and establishes a long-range vision for Charleston to expand and improve its linkable walking paths. The report did not identify any infrastructure improvements, but established the desire for alternative transportation

options and organized public recommendations using a collaborative community approach. Recommendations include:

- Develop a comprehensive implementation plan for greenspace and trail development (P. 24) Widening the upper level and lower level pathways so they become more accessible and multipurpose (P. 39)
- Steering committee members should continue to increase their leadership and promote greenway projects (P. 25)
- South Charleston active transportation and greenspace public recommendations (P.14)
- South Hills active transportation and greenspace public recommendations (P. 15)
- Kanawha City active transportation and greenspace public recommendations (P. 17)

MASTER PLAN FOR PEDESTRIAN AND BICYCLE TRAIL CORRIDORS - 2011

The Master Plan for Pedestrian and Bicycle Trail Corridors within the City of South Charleston, West Virginia reviewed and determined possible trail routes, ranked these routes in order of preference for funding, generated cross sections, and identified street markings and signage for basic routes. In total, five bicycle routes, 8 sharrow routes, six bicycle routes, and three connector trails were recommended. Other recommendations include:

- Bike lane recommendations (P. 18)
- Sharrow recommendations (P. 18-19)
- Connector trail recommendations (P. 21-22)

EAST END COMMUNITY RENEWAL PLAN - 2005; amended 2012

The East End Community Renewal Plan was first adopted in 1990 and has since been amended to include expansion of the original project area boundaries. The plan outlines a series of revitalization actions, including preservation and rehabilitation of existing structures, installation of new site improvements, redevelopment of sites by private owners, and the acquisition of sites for development and redevelopment. One of the primary objectives of the plan is to develop recreational amenities for residents of varying ages and physical abilities, giving high priority to locations north of Washington Street. There were no specific recommendations for bicycle and trail improvements.

IMAGINE CHARLESTON - COMPREHENSIVE PLAN - 2013

Imaging Charleston is a comprehensive plan that identifies and analyzes the city's elements to direct future land use, neighborhood and transportation improvements, and special strategies in key areas. Transportation goals specific to this plan include providing a network of bike trails and routes to improve the comfort and ease of use to walk and bicycle throughout the city and to provide a comfortable and well-maintained sidewalk and trail system. Recommendations include:

- Designate Quarrier and Virginia as major bike routes to and from the downtown
- A separate two-way bikeway along Kanawha Boulevard that links with a bikeway along

MacCorkle to complete a loop around the river (P. 33, P. 42)

- Planned and proposed bike route alignments (P. 41)
- Require bike racks for certain new, non-single family residents & add on-street bicycle parking to replace select on-street parking spaces in downtown area (P. 43)
- Designate a percentage of street funds for pedestrians/bicyclists (P. 43)
- Two-way separated bikeway from Patrick Street to Magic Island as part of a rail to trail grant (P. 43)
- Improve bike and pedestrian connections through acquisition of property (off road connections) to connect open spaces and activity centers (P. 79)
- Encourage business to be creative with bike parking (P. 82)

IMAGINE CHARLESTON - DOWNTOWN REDEVELOPMENT PLAN - 2013

The 2013 Downtown Charleston Redevelopment Plan, a part of the broader Comprehensive Plan, outlines a specific set of visions and goals, including improving pedestrian and bicycle access, promoting alternative transportation, promoting recreation opportunities that connect to the river, and employing traffic calming measure and improving the safety and attractiveness for bicycling and walking downtown. Recommendations include:

- Recommendation to adopt the Complete Streets approach (P. 58)
- Proposed trail network (P. 49)
- Encourages installation of bicycle racks downtown (P. 52)
- Recommended bike lane or sharrow street sections on Capital Street (P. 55-56)
- Recommendation to incorporate bikepaths where feasible, otherwise shared lane access (P. 58)
- Projects bike trail, and potential bike sharrow and recreation bike trail alignment (P. 59)

KANAWHA CITY CORRIDOR STUDY - 2013

The Kanawha City Corridor Study analyzes MacCorkle Avenue and provides recommendations to establish a proper urban form that promotes walkability and a variety of mixed uses, while de-emphasizing the micro-management and segregation of land use that is currently promoted by conventional zoning regulations. The plan recommends adopting a Complete Streets policy and using traffic calming, road diet, and access management solutions to make the road safer for all modes. The study also recommends several potential greenway links along the corridor (P. 51 -54)

KANAWHA TRESTLE AND RAIL TRAIL MASTER PLAN - 2013

Due to the costs associated with updating the Kanawha Trestle for pedestrian use, the 2014 Kanawha Trestle and Rail Trail Master Plan was developed to show how the Kanawha Boulevard can be utilized as the key link within the West Side trail system. The updated plan provides an extension to the overall trail plan that reaches

west to the neighboring municipality of South Charleston and east to downtown Charleston and the East End neighborhood. In addition to defining additional trail connections, the plan displays two trail section options and stormwater management solutions for Phase 1 of the Kanawha Boulevard. Recommendations include:

- Trail connection recommendation (P. 6-8)
- Phase 1 Kanawha Boulevard Trail Section A – protected two-way bicycle lane with 11 ft greenway buffer (P. 9)
- Phase 1 Kanawha Boulevard Trail Section B – protected two-way bicycle lane with 4 ft greenway buffer (P. 10)

WEST SIDE COMMUNITY RENEWAL PLAN - 2008; amended 2014

The 2014 West Side Community Renewal Plan Master Plan is an update to the original plan to include an expanded project area. The plan, including the expanded study area, address the preservation and rehabilitation of existing structures, streetscape and infrastructure improvements, designation or permitted uses on new redevelopment sites, redevelopment of sites by private interests and acquisition of sites for development and redevelopment. The plan includes recommendations for trail creation as well as recommendations to:

- Develop a trail on the abandoned CSX Trestle and the adjoining active Norfolk and Southern railroad lines from Kanawha Two Mile Creek to and beyond the railroad crossing of Washington Street at Maryland Ave (P. 9)
- Develop a footbridge connecting recommended Iowa Street open space to the North Charleston Recreation Center and another trail along the railroad tracks (P. 9)
- Formalize pedestrian access along the Norfolk and Southern Railroad as many people walk the tracks now (P. 10)

KEY FINDINGS

Based on the community feedback from each of the plans listed above, there is community wide interest in improving bicycling, trail, and greenway facilities throughout Charleston, West Virginia. Most of the existing planning efforts have been developed in recent years and set ambitious goals for improving the safety of bicyclists and connectivity of the non-motorized transportation system. Key themes from previous planning efforts include:

- Improved quality of life by providing multi-model travel choices and access to recreation.
- Increased connectivity to destinations such as downtown and parks by providing route options for all transportation modes.
- Complete streets design for new and existing roadways.
- Implementing bicycle facilities and expanding the trail network as tools to encourage economic development.

Appendix B - Citizen Comment Form

INTRODUCTION

This section includes supplemental figures and statistics gathered from the survey available from March 13, 2015 to April 13, 2015 that were not included in the main document text.

Figure B.1 and B.2 reveal that the vast majority of respondents would bicycle more often if more trails and bicycle facilities existed. Also, **over 75 percent of survey respondents have recently traveled to another city for bicycling and trail usage.**

FIGURES

Figure B.1 Bicycle more often if closer to trails and more bicycle facilities

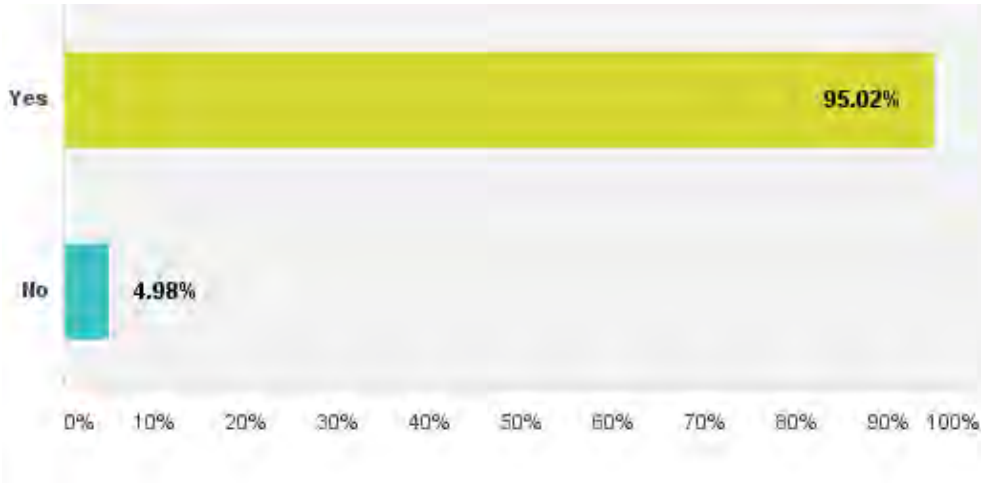


Figure B.2 Traveled to other cities to bicycle or use trails within the last two years

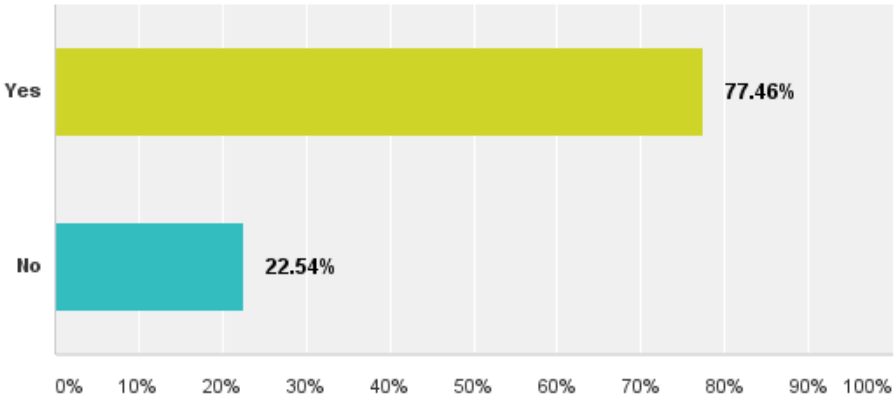
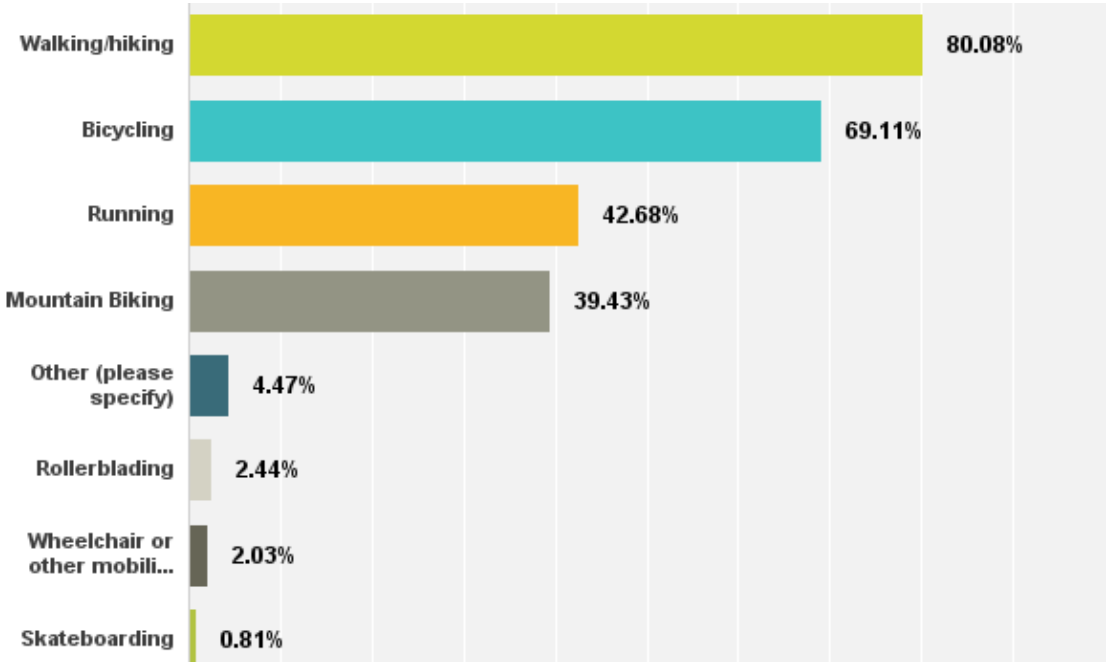


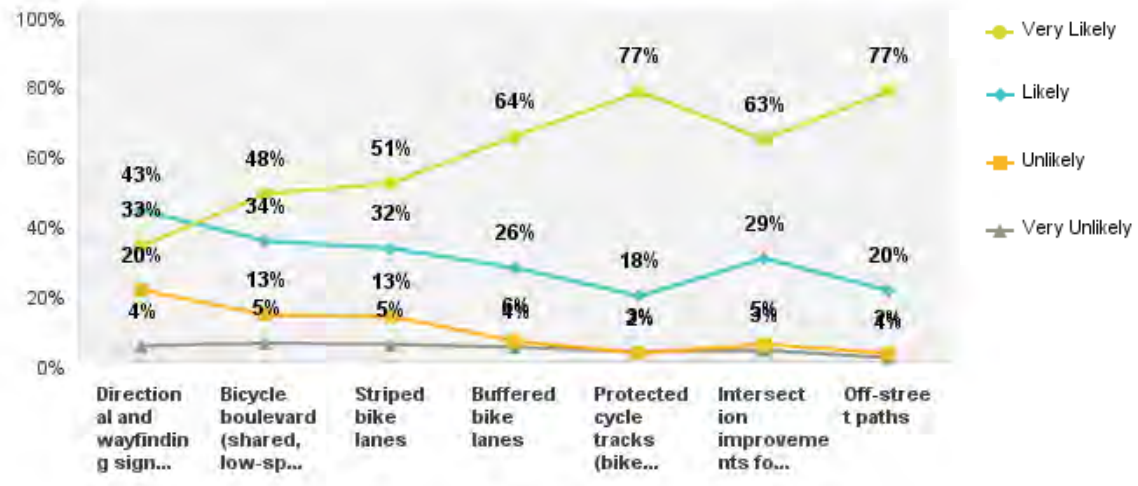
Figure B.3 shows the most common uses of existing trails in Charleston. Trail users generally engage in walking/hiking, bicycling, running, or mountain biking. Other uses for the trails include: rollerblading, wheelchair or other mobility assistance devices, and horseback riding, among others.

Figure B.3 Current trail usage



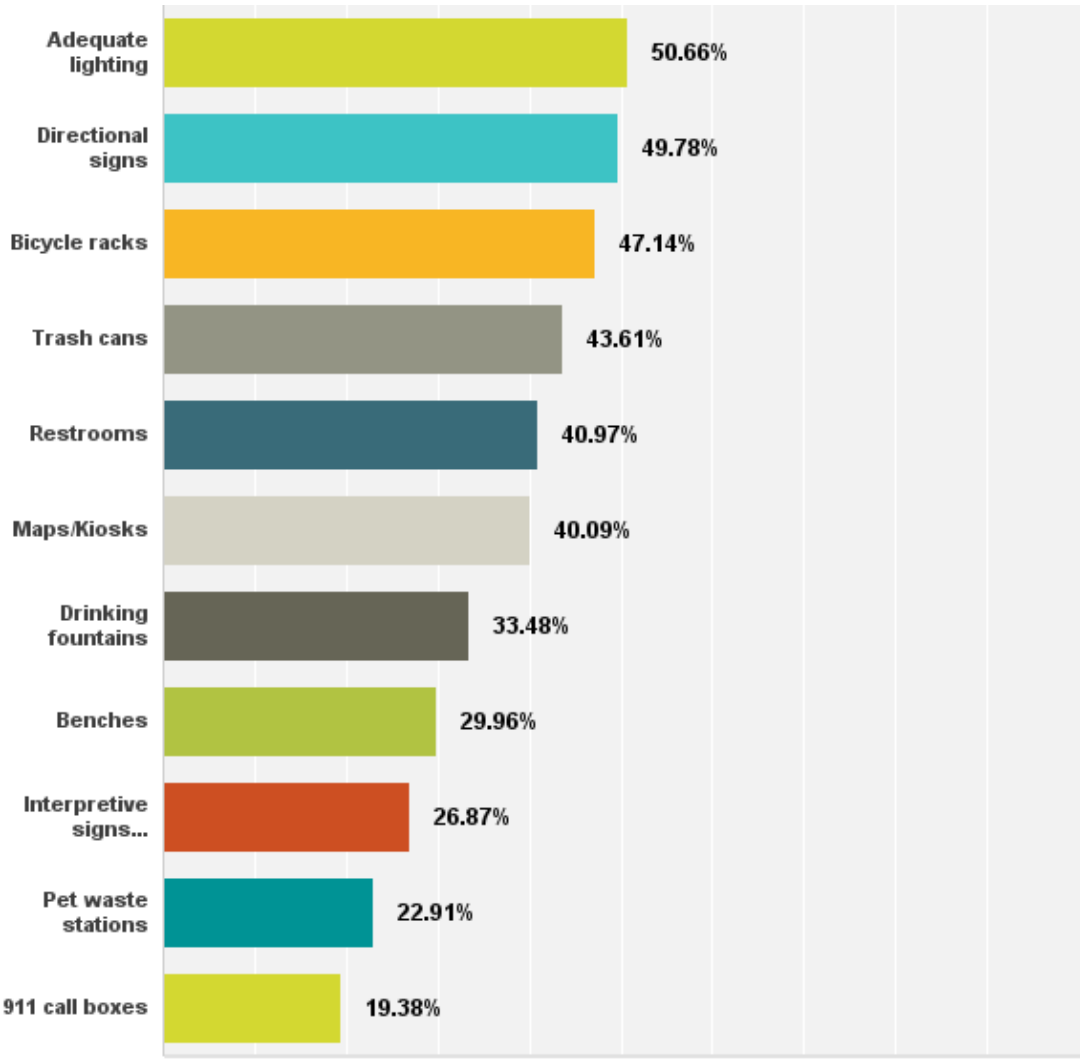
The survey question related to bicycle facility preferences revealed that separated bicycling facilities such as off-street paths, protected cycle tracks, and buffered bike lanes offer the greatest potential to increase levels of bicycle usage. Figure B.4 shows the percentage of respondents who identified each type of bicycle facility as Very Likely, Likely, Unlikely, or Very Unlikely to influence them to bicycle more often.

Figure B.4 Bicycle facilities that would influence bicycling



In regards to trail amenities, 51 percent of respondents found adequate lighting to be an important feature. Fifty percent also identified directional signs on the trail as important. Bicycle racks ranked as third most desired amenity. Figure B.5 presents the full results of the question asking what amenities are most important for trails in Charleston.

Figure B.5 Amenity preferences



CORRIDORS AND DESTINATIONS

The survey invited respondents to share the three most important corridors in Charleston for bicycling improvements. Below is a list of the roads most commonly cited:

- Kanawha Blvd
- Patrick Street
- MacCorkle Ave
- South Side Bridge

KANAWHA BOULEVARD

The most commonly cited intersections in need of bicycle improvements are:

- Virginia and Dickinson
- MacCorkle Ave and 35th St
- All Kanawha Blvd

PATRICK STREET

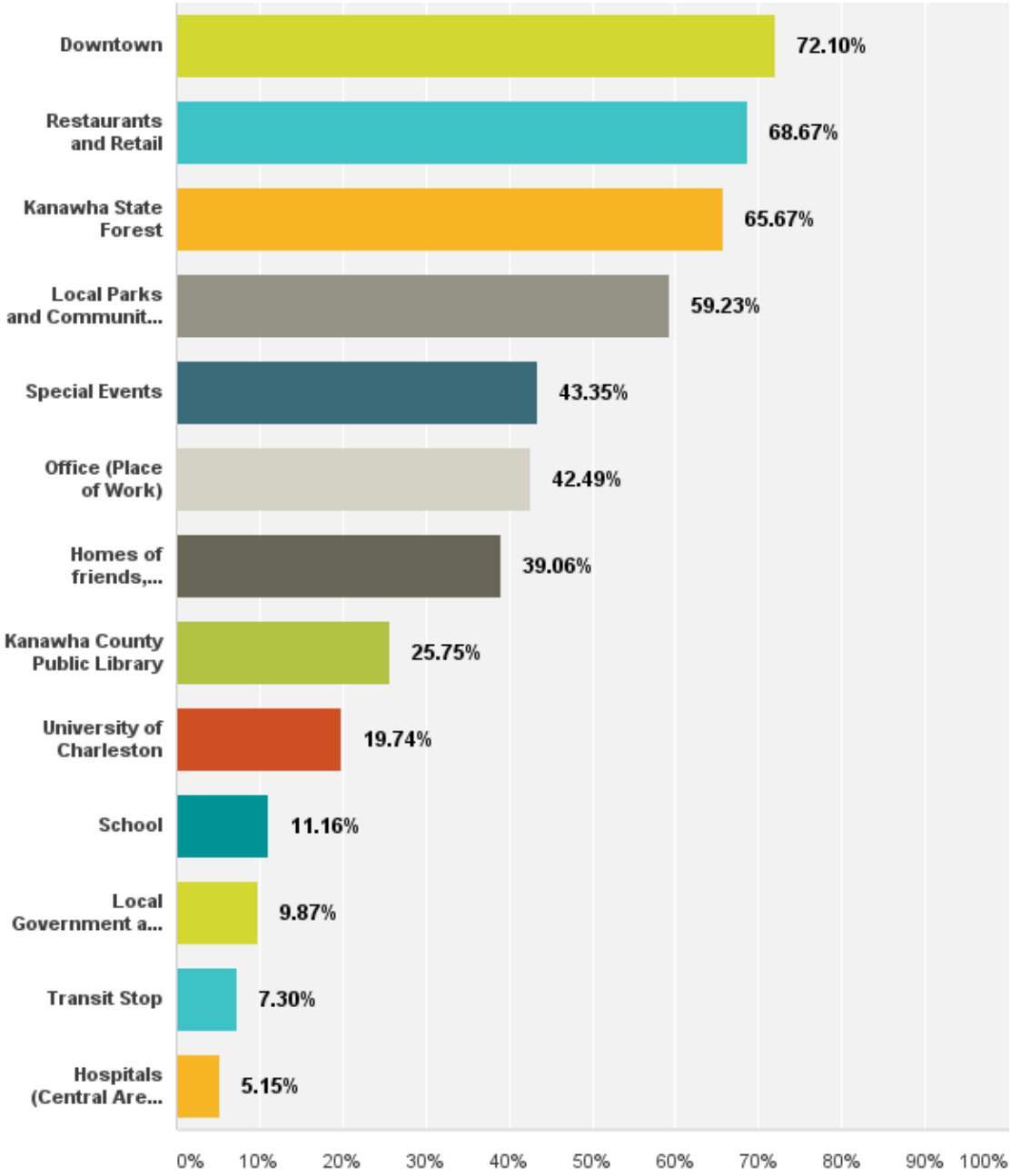
Respondents identified the following locations as priority sites for providing bicycling parking:

- Downtown
- Town Center Mall
- Capitol Street
- Magic Island

While there have been recent additions, a great demand for additional bike parking still exists downtown and in other locations throughout Charleston. The City could utilize sidewalk space or a vehicular parking stall to add additional bike parking capacity.

When asked what destination in Charleston respondents would **like to get to by bicycling or via the trail, 72 percent of respondents chose the downtown area**, which encompasses a variety of destinations and activities. Sixty nine percent of respondents would like to bike to restaurants and retail, 66 percent chose Kanawha State Forest, and 59 percent selected local parks and community centers. Figure R illustrates the percentage of respondents who chose each type of destination.

Figure B.6 Destination preference by bicycle or trail



Appendix C - BikeSpace Analysis

INTRODUCTION

A critical component of the bikeway network analysis was the use of Alta Planning + Design's 'BikeSpace' model. BikeSpace is an analysis tool that excels at quickly identifying corridors with the greatest potential for striping dedicated bicycle facilities. It does not make recommendations for non-delineated bikeway treatments such as shared lane markings, bicycle boulevards, or signed bike routes. Assuming acceptable minimum widths for each roadway element, the model analyzes a number of roadway characteristics to retrofit delineated bikeways on each surveyed roadway segment. Factors used in this analysis include:

- Current roadway width
- Raised or painted median
- Number and width of travel lanes
- Presence and number of turn lanes and medians
- Location and utilization of on-street parking
- Presence of roadway shoulder
- Average Annual Daily Traffic Volume (AADT), where available

In some cases, the retrofit is simple and only requires the addition of a separated bicycle facility in readily available roadway space. Other corridors may be more challenging and require a trade-off to gain the roadway space needed for the bikeway improvement. Though the model makes recommendations for implementing bikeways, its outcomes should not be considered a replacement for a striping plan. The model is useful in its ability to clearly illustrate locations where projects can be completed easily and locations where adding bike facilities may be challenging. The decision to narrow or eliminate a travel lane or remove on-street parking will need to be further studied with consideration given to the benefits of adding a bicycle facility. The City of Charleston will need to identify the impacts of altering the roadway's existing condition and, as with any roadway retrofit, conduct careful field analyses and detailed engineering studies prior to striping bike facilities.

Retaining a uniform roadway configuration throughout a corridor can simplify travel for motorists and cyclists alike, creating a safer and more comfortable experience for all users. It is recognized that acceptable street characteristics vary by jurisdiction. For the purposes of the model, acceptable minimum roadway dimensions were based on local practices and set at the following:

- Travel lane width 10 feet
- Right turn lane width: 10 feet
- Left or Center Turn Lane width: 10 feet
- Parking lane width: 7 feet
- Bike lane minimum width: 5 feet
- Buffered bike lane minimum width: 7 feet
- One-way cycle track minimum width: 9 feet
- Two-way cycle track minimum width: 10 feet
- Threshold AADT for 5 or 4 to 3 lane road diet: 18,000 AADT

BIKESPACE OUTCOMES

Analysis corridors were those corridors where delineated on-street bicycle facilities (bicycle lanes, buffered bike lanes, and cycle tracks) had been recommended as a part of this planning effort. BikeSpace results were used to help determine the near-term feasibility of proposed improvements and were incorporated into project prioritization.

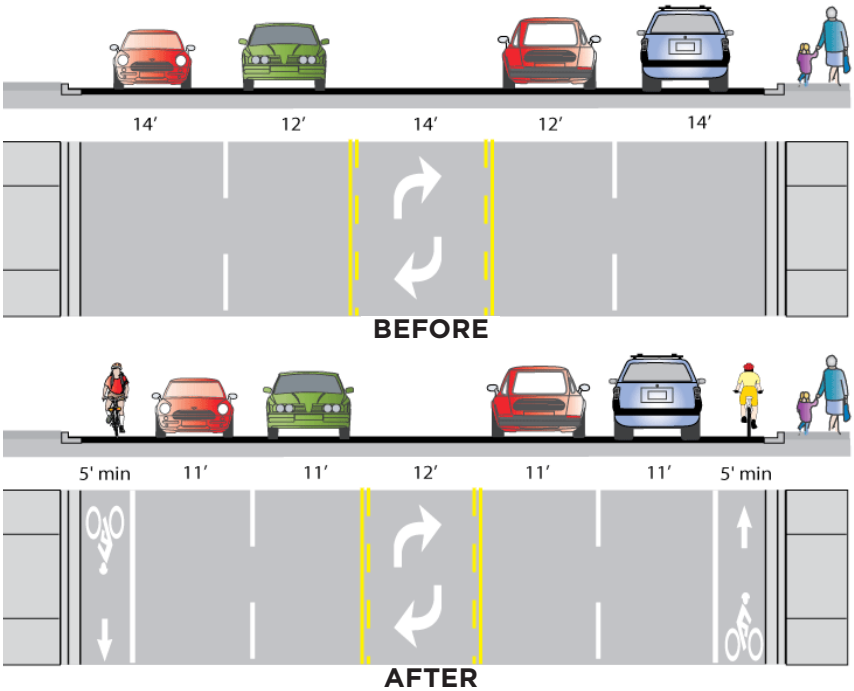
In many instances the BikeSpace model recommends multiple implementation strategies for a given roadway segment. To determine the appropriate treatment, the model organizes its recommendations in order of the most preferred facility type. The order uses the first strategy (below) for a given segment of roadway and is given priority over succeeding strategies. Not all of the below options were possible strategies for all segments, but on many segments multiple strategies could be used to implement bike facilities. Each of the specific treatment recommendations is defined in detail below.

BIKE FACILITIES FIT WITHIN EXISTING ROADWAY CONFIGURATION

In this option, enough surplus road space exists to simply add the bike facility without impacting the number of lanes or configuration of the roadway. This is by far the most desirable and easily implemented option available.

RECONFIGURE TRAVEL LANES AND/OR PARKING LANES

In this option, a bike facility can be added by simply narrowing wide travel lanes or parking lanes within the established minimums presented above. No reduction to the number of travel lanes or available parking is needed.



CANDIDATE FOR '5 TO 3' OR '4 to 3' ROAD DIET

In this option, a reconfiguration of the existing travel lanes may be necessary. In areas with two travel lanes in either direction, it may make sense to remove two travel lanes and use the spare roadway width to stripe a center turn lane and two 5' bike lanes (or other separated on-street bicycle facility). On roads with two travel lanes in each direction and a center turn lane, it may make sense to remove two travel lanes and use the spare roadway width to stripe buffered bike lanes or a cycle-track (either one-way or two-way). This treatment may not be appropriate on roads with high ADT.

ADD ADDITIONAL PAVEMENT WIDTH AND STRIPE BIKE LANES

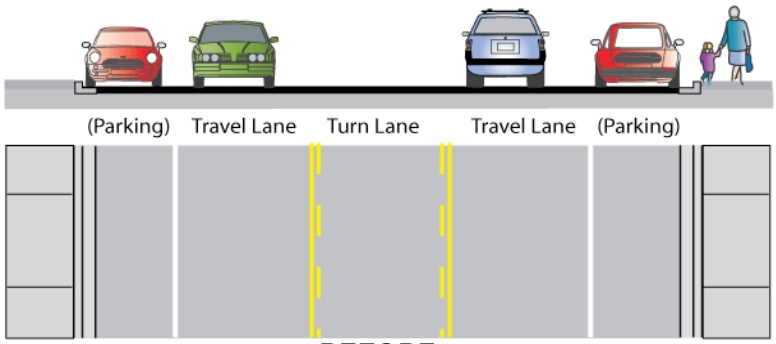
In this option, it was determined that additional right-of-way was available along the corridor. Where no curbs exist along the segment it may be possible to pave a new roadway shoulder and stripe bike lanes.

REMOVE ON-STREET PARKING

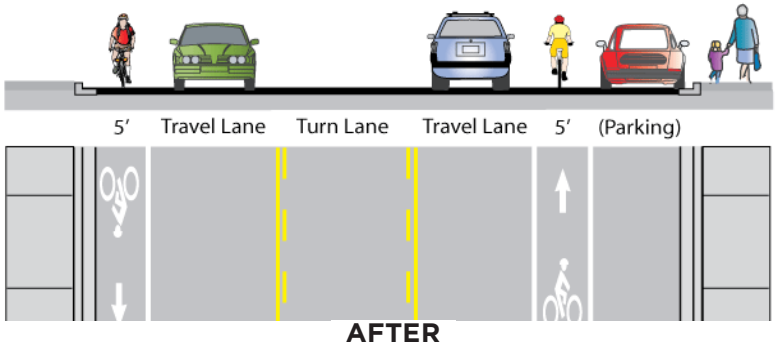
In this option, on-street parking may be removed on one side of the road. However this on-street parking configuration may currently be utilized in residential or commercial areas. This option is seen as a less desirable option and may only be considered as a last resort in short sections to maintain bike lane or cycle track continuity. A full parking study should be conducted to determine if excess parking capacity exists before making changes to the roadway configuration.

BIKE FACILITY WILL NOT FIT

In this last case, the existing roadway geometry will not allow for the addition of a separated on-street bikeway. Either a bike route or major reconstruction of the roadway may be necessary for bikeway continuity.



BEFORE



AFTER

GENERAL OUTCOMES

The project team incorporated the BikeSpace analysis into the recommended bikeway network GIS files provided to the City and utilized this information in prioritizing the recommended bicycle network. This information can also be used to help determine an implementation strategy for individual projects, although detailed studies and engineering judgment should always be used in project development. The following table explains how to interpret the BikeSpace data within the recommendations GIS file attribute table. As discussed previously, the table presents all potential implementation strategies. However, these are ranked in terms of ease of implementation from easiest/least expensive to most difficult/most expensive. Therefore it is recommended that the implementation strategy that appears first in the list be the most highly considered.

Table C.1 Guide to interpreting the GIS attribute table for BikeSpace data

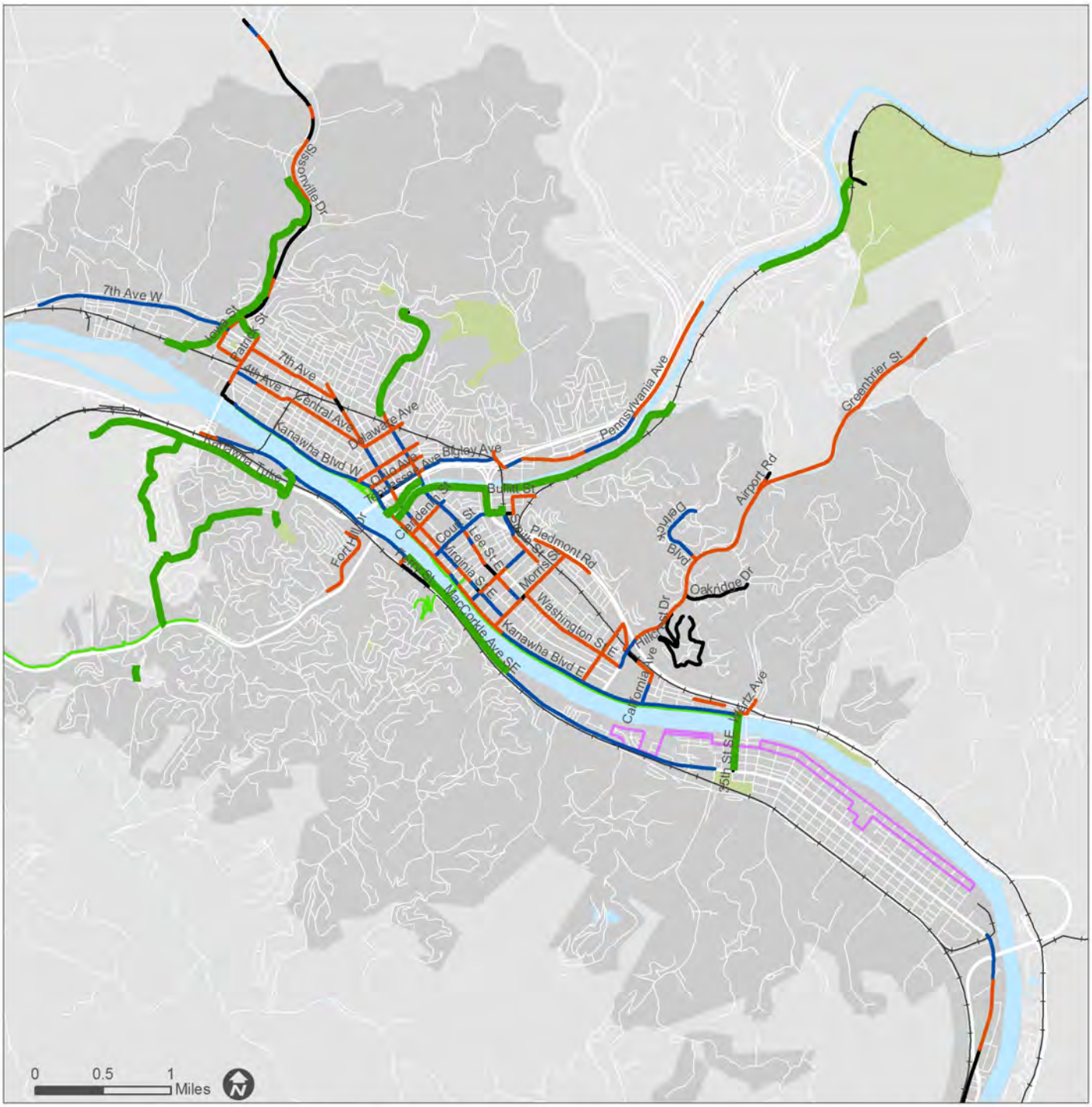
Corridor	From	To	Recommendation
Width_BL	Is there sufficient width to add separated bike facilities?	0= no, 1=yes	
Need_BL	Need separated bike facilities based on volume?	0= no, 1=yes	
Restr_Ex_Ln	Restripe existing outside lanes and add separated bike facilities	0= no, 1=yes	Most preferred implementation strategy (least cost/easiest to implement)
Reconfig_Wdth	Reconfigure lane or parking widths and add separated bike facilities	0= no, 1=yes	
Rd_Dt_Can	Candidate for Road Diet	0= no, 1=yes	Road diets are generally 4 or 5 lane roads reduced to 3 lanes
No_Lns_Rem	Number of lanes remaining after road diet	Value = number of lanes	
Rem_Park	Separated bike facility implementation would require removal of parking lanes	0= no, 1=yes	
Add_Wdth	Separated bike facilities will not fit within the existing roadway. Add additional roadway width and stripe bike lanes.	0= no, 1=yes	Least preferred implementation strategy (most cost/most difficult to implement)

ANALYSIS RESULTS

The map on the following page depicts an overview of the BikeSpace analysis results. In summary:

- **Blue lines show where multiple implementation strategies may be feasible** – these projects would likely be the easiest to implement in terms of facility design.
- **Red lines show where the BikeSpace tool determined that delineated bikeways are possible through a single implementation strategy** – these projects may be more difficult to implement, especially if there is a lack of support for the implementation strategy being proposed.
- **Black lines will require further study** as the BikeSpace tool determined that roadway widening or other strategies such as unique facility design are the only feasible implementation strategies.

Finally, the BikeSpace tool indicated that the majority of roadways with recommended separated bicycle facilities warranted these separated facilities based on traffic volumes. The project team provided a detailed table of the BikeSpace results to the City as a tool for selecting implementation strategies for this Plan's recommendations.



Charleston, WV BikeSpace Analysis Results Overview

Bikespace Analysis Results

- Easiest to Implement - Multiple Strategies Feasible
- Implementation More Difficult - One Strategy Feasible
- Further Study Needed

Recommended Bikeways

- Recommended Shared-use Paths

Existing Facilities

- Bike Route
- Shared-Use Path

Base Map Features

- Railroads
- Charleston City Limits

Appendix D - Potential Funding Sources

INTRODUCTION

This appendix outlines sources of funding for bicycle and trail projects in Charleston, WV. When considering possible funding sources for the Charleston bicycle and trail network, it is important to consider that not all construction activities may be accomplished with a single funding source. Bicycle funding is administered at all levels of government - federal, state, local, and through private sources. The following sections identify potential matching and major funding sources, and the criteria for bicycle projects and programs.

FEDERAL FUNDING SOURCES

Federal funding is typically directed through state agencies to local governments either in the form of grants or direct appropriations, independent from state budgets. Federal funding typically requires a local match of anywhere from five percent to 50 percent, but there are exceptions, such as the recent American Recovery and Reinvestment Act stimulus funds, which do not require a match. In West Virginia, federal monies are administered through the West Virginia Department of Highways (WVDOH) and metropolitan planning organizations (MPOs), such as the Regional Intergovernmental Council. Most, but not all, of these programs are oriented toward transportation, with an emphasis on reducing auto trips and providing intermodal connections. The following is a list of possible federal funding sources that could be used to support construction of bicycle and trail improvements.

MOVING AHEAD FOR PROGRESS IN THE TWENTY-FIRST CENTURY (MAP-21)

The largest source of federal funding for bicycle projects is the USDOT's Federal-Aid Highway Program, which Congress has reauthorized roughly every six years since the passage of the Federal-Aid Road Act of 1916. The current legislation, MAP-21 was enacted in July 2012, and authorizes funding for federal surface transportation programs, including highways and transit, until September 2014. The Act replaces the Safe, Accountable, Flexible, Efficient Transportation Equity Act – a Legacy for Users (SAFETEA-LU), which was valid from August 2005 through June 2012.

The reauthorization of MAP-21 is currently in progress, so the City of Charleston will need to keep track of potential funding as legislation develops. There are a number of programs identified within MAP 21 that are applicable to bicycle and trail projects. MAP-21 programs that are eligible to fund projects include:

- Federal Transit Administration (FTA) Capital Funds
- Associated Transit Improvement (ATI)
- Congestion Mitigation and Air Quality Improvement Program (CMAQ)
- National Highway Performance Program (National Highway System) (NHPP/NHS)
- Surface Transportation Program (STP)
- Transportation Alternatives Program/ Transportation Enhancement Activities (TAP/ TE)
- Federal Lands Highway Program (Federal Lands Access Program, Federal Lands

Transportation Program, Tribal Transportation Program) (FLH)

- Transportation, Community, and System Preservation Program (TCSP) – until funds expended

Most of these programs are competitive and involve documentation of the project need, costs, and benefits. Furthermore, it is not possible to guarantee the continued availability of any listed MAP-21 programs or to predict their future funding levels or policy guidance. Nevertheless, many of these programs have been included in some form since the passage of the Intermodal Surface Transportation Efficiency Act (ISTEA) in 1991, and, thus, may continue to provide capital for active transportation projects and programs.

For more information, visit:
http://www.fhwa.dot.gov/map21/summaryinfo.cfm

TRANSPORTATION ALTERNATIVES

Transportation Alternatives (TA) is a new funding source under MAP-21 that consolidates three formerly separate programs under SAFETEA-LU: Transportation Enhancements (TE), Safe Routes to School (SR2S), and the Recreational Trails Program (RTP). These funds may be used for a variety of pedestrian, bicycle, and streetscape projects including sidewalks, bikeways, multi-use paths, and rail-trails. TA funds may also be used for selected education and encouragement programming such as Safe Routes to School, despite the fact that TA does not provide a guaranteed set-aside for this activity as SAFETEA-LU did.

Complete eligibilities for TA include:

1. Transportation Alternatives as defined by Section 1103 (a) (29). This category includes the construction, planning, and design of a range of pedestrian and bicycle infrastructure including "on–road and off–road trail facilities for pedestrians, bicyclists, and other active forms of transportation, including sidewalks, bicycle infrastructure, pedestrian and bicycle signals, traffic calming techniques, lighting and other safety–related infrastructure, and transportation projects to achieve compliance with the Americans with Disabilities Act of 1990." Infrastructure projects and systems that provide "Safe Routes for Non-Drivers" is a new eligible activity.

For the complete list of eligible activities, visit:
http://www.fhwa. dot.gov/environment/ transportation_enhancements/legislation/ map21.cfm

2. Recreational Trails. TA funds may be used to develop and maintain recreational trails and trail-related facilities for both active and motorized recreational trail uses. Examples of trail uses include hiking, bicycling, in-line skating, equestrian use, and other active and motorized uses. These funds are available for both paved and unpaved trails, but may not be used to improve roads for general passenger vehicle use or to provide shoulders or sidewalks along roads.

Recreational Trails Program funds may be used for:

- Maintenance and restoration of existing trails
- Purchase and lease of trail construction and maintenance equipment

- Construction of new trails, including unpaved trails
- Acquisition or easements of property for trails
- State administrative costs related to this program (limited to seven percent of a state's funds)
- Operation of educational programs to promote safety and environmental protection related to trails (limited to five percent of a state's funds)

3. Safe Routes to School. The purpose of the Safe Routes to Schools eligibility is to promote safe, healthy alternatives to riding the bus or being driven to school. All projects must be within two miles of primary or middle schools (K-8).

Eligible projects may include:

- Engineering improvements. These physical improvements are designed to reduce potential pedestrian and bicycle conflicts with motor vehicles. Physical improvements may also reduce motor vehicle traffic volumes around schools, establish safer and more accessible crossings, or construct walkways, trails or bikeways. Eligible projects include sidewalk improvements, traffic calming/speed reduction, pedestrian and bicycle crossing improvements, on-street bicycle facilities, off-street pedestrian and bicycle facilities, and secure bicycle parking facilities.
- Education and Encouragement Efforts. These programs are designed to teach children safe bicycling and walking skills while educating them about the health benefits, and environmental impacts. Projects and programs may include creation, distribution and implementation of educational materials; safety-based field trips; interactive bicycle/ pedestrian safety video games; and promotional events and activities (e.g., assemblies, bicycle rodeos, walking school buses).
- Enforcement Efforts. These programs aim to ensure that traffic laws near schools are obeyed. Law enforcement activities apply to cyclists, pedestrians, and motor vehicles alike. Projects may include development of a crossing guard program, enforcement equipment, photo enforcement, and pedestrian sting operations.

4. Planning, designing, or constructing roadways within the right-of-way of former Interstate routes or divided highways. At the time of writing, detailed guidance from the Federal Highway Administration on this new eligible activity was not available.

Average annual funds available through TA over the life of MAP-21 equal $814 million nationally, which is based on a 2% set-aside of total MAP-21 authorizations. TA apportionments for 2013 and 2014 were slightly around $2.8 million for urbanized areas with populations more than 200,000 people. It is likely that 2015 funding will be substantially less due to a smaller overall apportionment of MAP-21 funding (http://www.fhwa.dot. gov/MAP21/funding.cfm). State DOTs may elect to transfer up to 50% of TA funds to other highway programs, so the amount listed above represents the maximum potential funding.

TA funds are typically allocated through the planning districts. Charleston's funding would come through the MPO. TA funds require a 20 percent

local match and must be administered by either WVDOH or a qualified Local Public Agency (LPA).

HIGHWAY SAFETY IMPROVEMENT PROGRAM

MAP-21 doubles the amount of funding available through the Highway Safety Improvement Program (HSIP) relative to SAFETEA-LU. HSIP provides $2.4 billion nationally for projects and programs that help communities achieve significant reductions in traffic fatalities and serious injuries on all public roads, bikeways, and walkways. Infrastructure and non-infrastructure projects are eligible for HSIP funds. Pedestrian and bicycle safety improvements, enforcement activities, traffic calming projects, and crossing treatments for active transportation users in school zones are examples of eligible projects. All HSIP projects must be consistent with the state's Strategic Highway Safety Plan.

Pedestrian and bicycle strategies identified in the 2014 Draft SHSP include engineering bike lanes, sidewalks and shared-use paths, especially where supported by crash data, educational programs and targeted enforcement.

CONGESTION MITIGATION/AIR QUALITY IMPROVEMENT PROGRAM

The Congestion Mitigation/Air Quality Improvement Program (CMAQ) provides funding for projects and programs in air quality non-attainment and maintenance areas for ozone, carbon monoxide, and particulate matter, which reduces transportation related emissions. States without non-attainment areas may use their CMAQ funds for any CMAQ or STP eligible project. These federal dollars can be used to build bicycle facilities that reduce travel by automobile. Communities located in attainment areas who do not receive CMAQ funding apportionments may apply for CMAQ funding to implement projects that will reduce travel by automobile.

For more information, visit:
http://www.fhwa.dot.gov/map21/cmaq.cfm

FEDERAL TRANSIT ADMINISTRATION (FTA) METROPOLITAN PLANNING

This program provides funding for metropolitan coordinated transportation planning. Federal planning funds are first apportioned to State DOTs. State DOTs then allocate planning funding to MPOs. Eligible activities include bicycle planning to increase safety for non-motorized users and to enhance the interaction and connectivity of the transportation system across and between modes.

For more information, visit:
http://www.fhwa.dot.gov/map21/cmaq.cfm

PARTNERSHIP FOR SUSTAINABLE COMMUNITIES

The Partnership for Sustainable Communities is a joint project of the Environmental Protection Agency (EPA), the U.S. Department of Housing and Urban Development (HUD), and the U.S. Department of Transportation (USDOT). The partnership aims to "improve access to affordable housing, more transportation options, and lower transportation costs while protecting the environment in communities nationwide." It is based on five Livability Principles, one of which explicitly

addresses the need for bicycle infrastructure ("Provide more transportation choices: Develop safe, reliable, and economical transportation choices to decrease household transportation costs, reduce our nation's dependence on foreign oil, improve air quality, reduce greenhouse gas emissions, and promote public health").

It is not a formal agency with a regular annual grant program. Nevertheless, it is an important effort that has already led to some new grant opportunities (including TIGER grants). Charleston should track Partnership communications and be prepared to respond proactively to announcements of new grant programs.

For more information, visit:
http://www.epa.gov/smartgrowth/partnership/

RIVERS, TRAILS, AND CONSERVATION ASSISTANCE PROGRAM

The Rivers, Trails, and Conservation Assistance Program (RTCA) is a National Parks Service (NPS) program providing technical assistance via direct NPS staff involvement to establish and restore greenways, rivers, trails, watersheds and open space. The program only provides planning assistance. Projects are prioritized for assistance based on criteria including conserving significant community resources, fostering cooperation between agencies, serving a large number of users, encouraging public involvement in planning and implementation, and focusing on lasting accomplishments. This program may benefit trail development in Charleston and the region indirectly through technical assistance, particularly for community organizations, but is not be considered a future capital funding source.

For more information, visit:
http://www.nps.gov/orgs/rtca/apply.htm

COMMUNITY DEVELOPMENT BLOCK GRANTS

The Community Development Block Grants (CDBG) program provides money for streetscape revitalization. Federal CDBG grantees may "use Community Development Block Grants funds for activities that include (but are not limited to): acquiring real property; reconstructing or rehabilitating housing and other property; building public facilities and improvements, such as streets, sidewalks, community and senior citizen centers and recreational facilities; paying for planning and administrative expenses, such as costs related to developing a consolidated plan and managing Community Development Block Grants funds; provide public services for youths, seniors, or the disabled; and initiatives such as neighborhood watch programs."

For more information, visit:
www.hud.gov/cdbg

COMMUNITY TRANSFORMATION GRANTS

Community Transformation Grants administered through the Center for Disease Control support community–level efforts to reduce chronic diseases such as heart disease, cancer, stroke, and diabetes. Active transportation infrastructure and programs that promote healthy lifestyles are a good fit for this program, particularly if the benefits of such improvements accrue to population groups experiencing the greatest burden of chronic disease.

For more information, visit:
www.hud.gov/cdbg

OTHER FEDERAL TRANSIT ADMINISTRATION FUNDING SOURCES FOR BICYCLE INFRASTRUCTURE AND BIKE SHARE

Most FTA funding can be used to fund bicycle and trail projects "that enhance or are related to public transportation facilities." According to the FTA, an FTA grantee may use any of the following programs under Title 49, Chapter 53, of the United States Code to fund capital projects for bicycle access to a public transportation facility:

- Section 5307 Urbanized Area Formula Program
- Section 5309 New Starts and Small Starts Major Capital Investment Programs
- Section 5309 Fixed Guideway Modernization Program
- Section 5309 Bus and Bus Facilities Discretionary Program
- Section 5310 Elderly Individuals and Individuals with Disabilities Formula Program
- Section 5311 Non-Urbanized Area Formula Program
- Section 5311 Public Transportation on Indian Reservations
- Section 5316 Job Access & Reverse Commute Formula Program;
- Section 5317 New Freedom Program
- Section 5320 Paul S. Sarbanes Alternative Transportation in Parks and Public Lands

STATE FUNDING SOURCES

While federal funding programs are often the central source of funding for trail development, a state's parks, recreation, conservation, natural resources or environmental protection department or agency also administers funding. The Department of Highways has a designated bicycle/pedestrian coordinator in place to encourage and facilitate bike/ped provisions on state-owned roads. The City of Charleston should continue to work with the Coordinator and DOH to ensure bicycle and pedestrian accommodations are included on roadways.

RECREATION TRAILS FUND PROGRAM (RTP)

RTP is an assistance program established through the Federal Highway Administration whose purpose is to enhance livable communities through the development and maintenance of recreational trails and trail-related facilities. Each state has its own RTP Administrator to aid in project eligibility requirements and State policies. There is an opportunity for recognition with this assistance program as the Coalition for Recreational Trails (CRT) recognizes outstanding RTP projects annually. Earning this recognition could only support future funding efforts.

For more information, visit:
www.hud.gov/cdbg

WEST VIRGINIA DEPARTMENT OF HEALTH AND HUMAN RESOURCES

The WV Department of Health and Human Resources has historically held grant programs that support the development of active communities. For example, the Community-based initiatives grants provided funding for communities to create "walkable" environments and policies that provide opportunities to be physically active.

WV DHHR Website:
http://www.dhhr.wv.gov/bph/Pages/default.aspx

WEST VIRGINIA DEPARTMENT OF HEALTH AND HUMAN RESOURCES

The Stream Partners Program is a cooperative grant program run through he West Virginia Conservation Agency, West Virginia's Department of Environmental Protection, Division of Forestry, and the Division of Natural Resources. The program is housed within the WVDEP's Division of Water and Waste Management. It provides $5,000 seed grants to community organizations on an annual basis for watershed improvement projects. These projects can include trail improvement projects that contribute to watershed health.

For more information, visit: http://www.dep.wv.gov/WWE/getinvolved/WSA_Support/Pages/StreamPartners.aspx

LOCAL FUNDING SOURCES

Local funding sources that would support bike facility project construction will most likely be limited but should be explored to support Charleston's bicycle and trail transportation projects. Typical capital funding mechanisms include the following: capital reserve fund, community development authorities, tax increment financing, taxes, fees, and bonds. Each category is described below; however, many will require specific local action as a means of establishing a program, if not already in place.

GENERAL FUND

The General Fund is often used to pay for maintenance expenses and limited capital improvement projects. Projects identified for reconstruction or re-pavement as part of the capital improvements list should also incorporate recommendations for bicycle or pedestrian improvements in order to reduce additional costs. More information on the City of Charleston budget and General Fund can be found here:

http://www.cityofcharleston.org/government/city-departments/finance

CAPITAL RESERVE FUND

Cities have statutory authority to create capital reserve funds for any capital purpose, including bicycle facilities. The reserve fund must be created through ordinance or resolution that states the purpose of the fund, the duration of the fund, the approximate amount of the fund, and the source of revenue for the fund. Sources of revenue can include general fund allocations, fund balance allocations, grants and donations for the specified use.

STORMWATER UTILITY FEES

Stormwater charges are typically based on an estimate of the amount of impervious surface on a user's property. Impervious surfaces (such as rooftops and paved areas) increase both the amount and rate of stormwater runoff compared to natural conditions. Such surfaces cause runoff that directly or indirectly discharges into public storm drainage facilities and creates a need for stormwater management services. Thus, users with more impervious surface are charged more for stormwater service than users with less impervious surface.

SYSTEM DEVELOPMENT CHARGES/DEVELOPER IMPACT FEES

System Development Charges (SDCs), also known as Developer Impact Fees, represent another potential local funding source. SDCs are typically tied to trip generation rates and traffic impacts produced by a proposed project. A developer may reduce the number of trips (and hence impacts and cost) by paying for on- or off-site pedestrian improvements that will encourage residents to walk (or use transit, if available) rather than drive. In-lieu parking fees may be used to help construct new or improved pedestrian facilities. Establishing a clear nexus or connection between the impact fee and the project's impacts is critical in avoiding a potential lawsuit.

STREET USER FEES

Many cities administer street user fees through residents' monthly water or other utility bills. The revenue generated by the fee can be used for operations and maintenance of the street system, and priorities would be established by the Public Works Department. Revenue from this fund can be used to maintain on-street pedestrian and bicycle facilities, including routine sweeping of bicycle lanes and other designated bicycle routes.

IN LIEU OF FEES

Developers often dedicate open space or greenways in exchange for waiving fees associated with park and open space allocation requirements in respect to proposed development. These types of requirements are presented within local municipal codes and ordinances.

UTILITY LEASE REVENUE

A method to generate revenues from land leased to utilities for locating utility infrastructure on municipally owned parcels. This can improve capital budgets and support financial interest in property that would not otherwise create revenue for the government.

BUSINESS IMPROVEMENT AREA OR DISTRICT (BIA OR BID)

Trail development and pedestrian and bicycle improvements can often be included as part of larger efforts aimed at business improvement and retail district beautification. Business Improvement Areas collect levies on businesses in order to fund area wide improvements that benefit businesses and improve access for customers. These districts may include provisions for pedestrian and bicycle improvements, including as wider

downtown revitalization projects are one of the eligible uses of service districts and can include projects such as street, sidewalk, or bikeway improvements within the downtown taxing district.

SALES TAX

Local governments that choose to exercise a local option sales tax use the tax revenues to provide funding for a wide variety of projects and activities. For example, Columbia, South Carolina has included pedestrian and bicycle projects as part of the county-wide one-cent sales tax addendum. In 2012, Richland County voters passed a 1% sales addendum to fund $1.07 billion in transportation improvements county-wide over the following 22 years. $81 M of this revenue will go towards sidewalks, bike lanes and greenways. This should prove to be a huge boom to walking and bicycling in the region in the coming years. For more information on the sales tax passed there visit:

http://www.richlandonline.com/Government/TransportationPenny.aspx

PROPERTY TAX

Property taxes generally support a significant portion of a local government's activities. However, the revenues from property taxes can also be used to pay debt service on general obligation bonds issued to finance open space system acquisitions. Because of limits imposed on tax rates, use of property taxes to fund open space could limit the county's or a municipality's ability to raise funds for other activities. Property taxes can provide a steady stream of financing while broadly distributing the tax burden. In other parts of the country, this mechanism has been popular with voters as long as the increase is restricted to parks and open space. It should be noted that other public agencies compete vigorously for these funds, and taxpayers are generally concerned about high property tax rates.

EXCISE TAX

Excise taxes are taxes on specific goods and services. These taxes require special legislation and the use of the funds generated through the tax are limited to specific uses. Examples include lodging, food, and beverage taxes that generate funds for promotion of tourism, and the gas tax that generates revenues for transportation-related activities.

TAX INCREMENT FINANCING

In 2002, West Virginia State Legislature passed an amendment allowing the use of tax increment financing (TIF). This amendment (W. Va. Code §7-11-B-1 et seq.,) captures the projected increase in property tax revenue gained to assist in paying for projects. When a public project (e.g., a greenway trail) is constructed, surrounding property values generally increase and encourage surrounding development or redevelopment. The increased tax revenues are then dedicated to finance the debt created by the original public improvement project. Community revitalization elements such as streetscapes, landscaping, and street lighting, are specifically authorized for TIF funding in West Virginia. Tax Increment Financing typically occurs within designated development financing districts that meet certain economic criteria that are approved by a local governing body.

More information: http://www.revenue.wv.gov/Documents/tifhandbook.pdf

PRIVATE SECTOR FUNDING SOURCES

Many communities have solicited greenway funding assistance from private foundations and other conservation-minded benefactors. Below are several examples of private funding opportunities available.

BIKES BELONG GRANT PROGRAM

The Bikes Belong Coalition of bicycle suppliers and retailers has awarded $1.2 million and leveraged an additional $470 million since its inception in 1999. The program funds corridor improvements, mountain bike trails, BMX parks, trails, and park access. It is funded by the Bikes Belong Employee Pro Purchase Program.

For more information, visit:
http://www.bikesbelong.org/grants/

THE ROBERT WOOD JOHNSON FOUNDATION

The Robert Wood Johnson Foundation was established as a national philanthropy in 1972 and today it is the largest U.S. foundation devoted to improving the health and health care of all Americans. Grant making is concentrated in four areas:

- To assure that all Americans have access to basic health care at a reasonable cost
- To improve care and support for people with chronic health conditions
- To promote healthy communities and lifestyles
- To reduce the personal, social and economic harm caused by substance abuse: tobacco, alcohol, and illicit drugs

For more information, visit:
http://www.rwjf.org/applications/

BANK OF AMERICA CHARITABLE FOUNDATION, INC.

The Bank of America Charitable Foundation is one of the largest in the nation. The primary grants program is called Neighborhood Excellence, which seeks to identify critical issues in local communities. Another program that applies to greenways is the Community Development Programs, and specifically the Program Related Investments. This program targets low and moderate income communities and serves to encourage entrepreneurial business development.

For more information, visit:
http://www.bankofamerica.com/foundation

THE WALMART FOUNDATION

The Walmart Foundation offers a Local, State, and National giving program. The Local Giving Program awards grants of $250 to $5,000 through local Walmart and Sam's Club Stores. Application opportunities are announced annually in February with a final deadline for applications in December. The State Giving Program provides grants of $25,000 to $250,000 to 501c3 nonprofits working within one of five focus areas: Hunger Relief & Nutrition, Education, Environmental Sustainability, Women's Economic Empowerment, or Workforce Development. The program has two application cycles per year: January through March and June through August. The Walmart Foundation's National Giving Program awards grants of $250,000 and more, but does not accept unsolicited applications.

For more information, visit:
http://foundation.walmart.com/apply-for-grants

THE KODAK AMERICAN GREENWAYS PROGRAM

The Conservation Fund's American Greenways Program has teamed with the Eastman Kodak Corporation and the National Geographic Society to award small grants ($250 to $2,000) to stimulate the planning, design and development of greenways. These grants can be used for activities such as mapping, conducting ecological assessments, surveying land, holding conferences, developing brochures, producing interpretive displays, incorporating land trusts, and building trails. Grants cannot be used for academic research, institutional support, lobbying or political activities.

For more information, visit:
http://www.bankofamerica.com/foundation

NATIONAL TRAILS FUND

American Hiking Society created the National Trails Fund in 1998, the only privately supported national grants program providing funding to grassroots organizations working toward establishing, protecting and maintaining foot trails in America. 73 million people enjoy foot trails annually, yet many of our favorite trails need major repairs due to a $200 million backlog of badly needed maintenance. National Trails Fund grants help give local organizations the resources they need to secure access, volunteers, tools and materials to protect America's cherished public trails. To date, American Hiking has granted more than $240,000 to 56 different trail projects across the U.S. for land acquisition, constituency building campaigns, and traditional trail work projects. Awards range from $500 to $10,000 per project.

Projects the American Hiking Society will consider include:

- Securing trail lands, including acquisition of trails and trail corridors, and the costs associated with acquiring conservation easements.
- Building and maintaining trails which will result in visible and substantial ease of access, improved hiker safety, and/ or avoidance of environmental damage.
- Constituency building surrounding specific trail projects - including volunteer recruitment and support.

For more information, visit:
http://www.americanhiking.org/alliance/fund.html

THE CONSERVATION ALLIANCE

The Conservation Alliance is a non-profit organization of outdoor businesses whose collective annual membership dues support grassroots citizen-action groups and their efforts to protect wild and natural areas. One hundred percent of its member companies' dues go directly to diverse, local community groups across the nation– groups like Southern Utah Wilderness Alliance, Alliance for the Wild Rockies, The Greater Yellowstone Coalition, the South Yuba River Citizens' League, RESTORE: The North Woods and the Sinkyone Wilderness Council (a Native American-owned/operated wilderness park). For these groups, who seek to protect the last great wild lands and waterways from resource extraction and commercial development, the Alliance's grants are substantial in size (about $35,000 each),

have often made the difference between success and defeat. Since its inception in 1989, The Conservation Alliance has contributed $4,775,059 to grassroots environmental groups across the nation, and its member companies are proud of the results: To date the groups funded have saved over 34 million acres of wild lands and 14 dams have been either prevented or removed-all through grassroots community efforts.

The Conservation Alliance is a unique funding source for grassroots environmental groups. It is the only environmental grant maker whose funds come from a potent yet largely untapped constituency for protection of ecosystems – the active transportation outdoor recreation industry and its customers. This industry has great incentive to protect the places in which people use the clothing, hiking boots, tents and backpacks it sells.

The industry is also uniquely positioned to educate outdoor enthusiasts about threats to wild places, and engage them to take action. Finally, when it comes to decision–makers, especially those in the Forest Service, National Park Service, and Bureau of Land Management, this industry has clout - an important tool that small advocacy groups can wield.

The Conservation Alliance Funding Criteria: The Project should be focused primarily on direct citizen action to protect and enhance our natural resources for recreation. The Alliance does not look for mainstream education or scientific research projects, but rather for active campaigns. All projects should be quantifiable, with specific goals, objectives and action plans and should include a measure for evaluating success. The project should have a good chance for closure or significant measurable results over a fairly short term (one to two years). Funding emphasis may not be on general operating expenses or staff payroll.

For more information, visit:
http://www.conservationalliance.com/index.m

NATIONAL FISH AND WILDLIFE FOUNDATION

The National Fish and Wildlife Foundation (NFWF) is a private, nonprofit, tax-exempt organization chartered by Congress in 1984. The National Fish and Wildlife Foundation sustains, restores, and enhances the Nation's fish, wildlife, plants and habitats. Through leadership conservation investments with public and private partners, the Foundation is dedicated to achieving maximum conservation impact by developing and applying best practices and innovative methods for measurable outcomes.

The Foundation awards matching grants under its Keystone Initiatives to achieve measurable outcomes in the conservation of fish, wildlife, plants and the habitats on which they depend. Awards are made on a competitive basis to eligible grant recipients, including federal, tribal, state, and local governments, educational institutions, and non-profit conservation organizations. Project proposals are received on a year-round, revolving basis with two decision cycles per year. Grants generally range from $50,000- $300,000 and typically require a minimum 2:1 non-federal match.

Funding priorities include bird, fish, marine/coastal, and wildlife and habitat conservation. Other projects that are considered include controlling invasive species, enhancing delivery of ecosystem

services in agricultural systems, minimizing the impact on wildlife of emerging energy sources, and developing future conservation leaders and professionals.

For more information, visit:
http://www.nfwf.org/AM/Template.cfm?Section=Grants

THE TRUST FOR PUBLIC LAND

Land conservation is central to the mission of the Trust for Public Land (TPL). Founded in 1972, the Trust for Public Land is the only national nonprofit working exclusively to protect land for human enjoyment and wellbeing. TPL helps conserve land for recreation and spiritual nourishment and to improve the health and quality of life of American communities. Also, TPL is the leading organization helping agencies and communities identify and create funds for conservation from federal, state, local, and philanthropic sources.

Since 1996, TPL has helped states and communities craft and pass over 382 successful ballot measures, generating $34 billion in new conservation-related funding.

For more information, visit:
http://www.tpl.org/what-we-do/services/conservation-finance/

COMMUNITY ACTION FOR A RENEWED ENVIRONMENT (CARE)

CARE is a competitive grant program that offers an innovative way for a community to organize and take action to reduce toxic pollution in its local environment. Through CARE, a community creates a partnership that implements solutions to reduce releases of toxic pollutants and minimize people's exposure to them. By providing financial and technical assistance, EPA helps CARE communities get on the path to a renewed environment. Transportation and "smart-growth" types of projects are eligible. Grants range between $90,000 and $275,000.

For more information, visit:
http://www.epa.gov/care/

LOCAL TRAIL SPONSORS

A sponsorship program for trail amenities allows smaller donations to be received from both individuals and businesses. Cash donations could be placed into a trust fund to be accessed for certain construction or acquisition projects associated with the greenways and open space system. Some recognition of the donors is appropriate and can be accomplished through the placement of a plaque, the naming of a trail segment, and/or special recognition at an opening ceremony. Types of gifts other than cash could include donations of services, equipment, labor, or reduced costs for supplies.

CORPORATE DONATIONS

Corporate donations are often received in the form of liquid investments (i.e. cash, stock, bonds) and in the form of land. Employers recognize that creating places to bike and walk is one way to build community and attract a quality work force. Bicycling and outdoor recreation businesses often support local projects and programs. Municipalities typically create funds to facilitate and simplify a

transaction from a corporation's donation to the given municipality. Donations are mainly received when a widely supported capital improvement program is implemented. Such donations can improve capital budgets and/or projects.

OTHER FUNDING SOURCES

VOLUNTEER WORK AND PUBLIC-PRIVATE PARTNERSHIPS

Individual volunteers from the community can be brought together with groups of volunteers from church groups, civic groups, scout troops and environmental groups to work on greenway development on special community workdays. Volunteers can also be used for fundraising, maintenance, and programming needs. Local schools or community groups may use the bikeway projects as a project for the year, possibly working with a local designer or engineer. Work parties may be formed to help clear the right-of-way where needed. A local construction company may donate or discount services. A challenge grant program with local businesses may be a good source of local funding, where corporations 'adopt' a bikeway and help construct and maintain the facility.

PRIVATE INDIVIDUAL DONATIONS

Private individual donations can come in the form of liquid investments (i.e. cash, stock, bonds) or land. Municipalities typically create funds to facilitate and simplify a transaction from an individual's donation to the given municipality. Donations are mainly received when a widely supported capital improvement program is implemented. Such donations can improve capital budgets and/or projects.

FUNDRAISING / CAMPAIGN DRIVES

Organizations and individuals can participate in a fundraiser or a campaign drive. It is essential to market the purpose of a fundraiser to rally support and financial backing. Oftentimes fundraising satisfies the need for public awareness, public education, and financial support.

LAND TRUST ACQUISITION AND DONATION

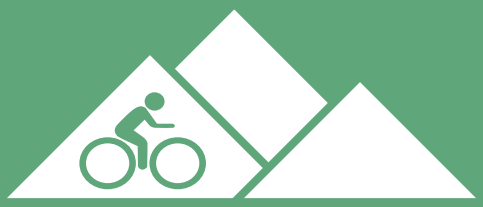
Land trusts are held by a third party other than the primary holder and the beneficiaries. This land is oftentimes held in a corporation for facilitating the transfer between two parties. For conservation purposes, land is often held in a land trust and received through a land trust. A land trust typically has a specific purpose such as conservation and is used so land will be preserved as the primary holder had originally intended.

ADOPT-A-TRAIL PROGRAM

A challenge grant program with local businesses may be a good source of local funding, where corporations 'adopt' a trail and help maintain the facility. Foundation grants, volunteer work, and donations of in-kind services, equipment, labor or materials are other sources of support that can play a supporting role in gathering resources to design and build new pedestrian and bicycle facilities.

Residents and other community members are excellent resources for garnering support and

enthusiasm for a trail, and Charleston should work with volunteers to substantially reduce implementation and maintenance costs. Local schools, community groups, or a group of dedicated neighbors may use the project as a goal for the year, possibly working with a local designer or engineer. Work parties can be formed to help clear the right-of-way for a new trail or maintain existing facilities where needed.



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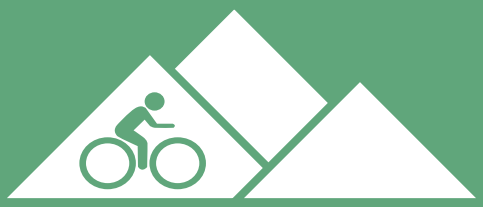

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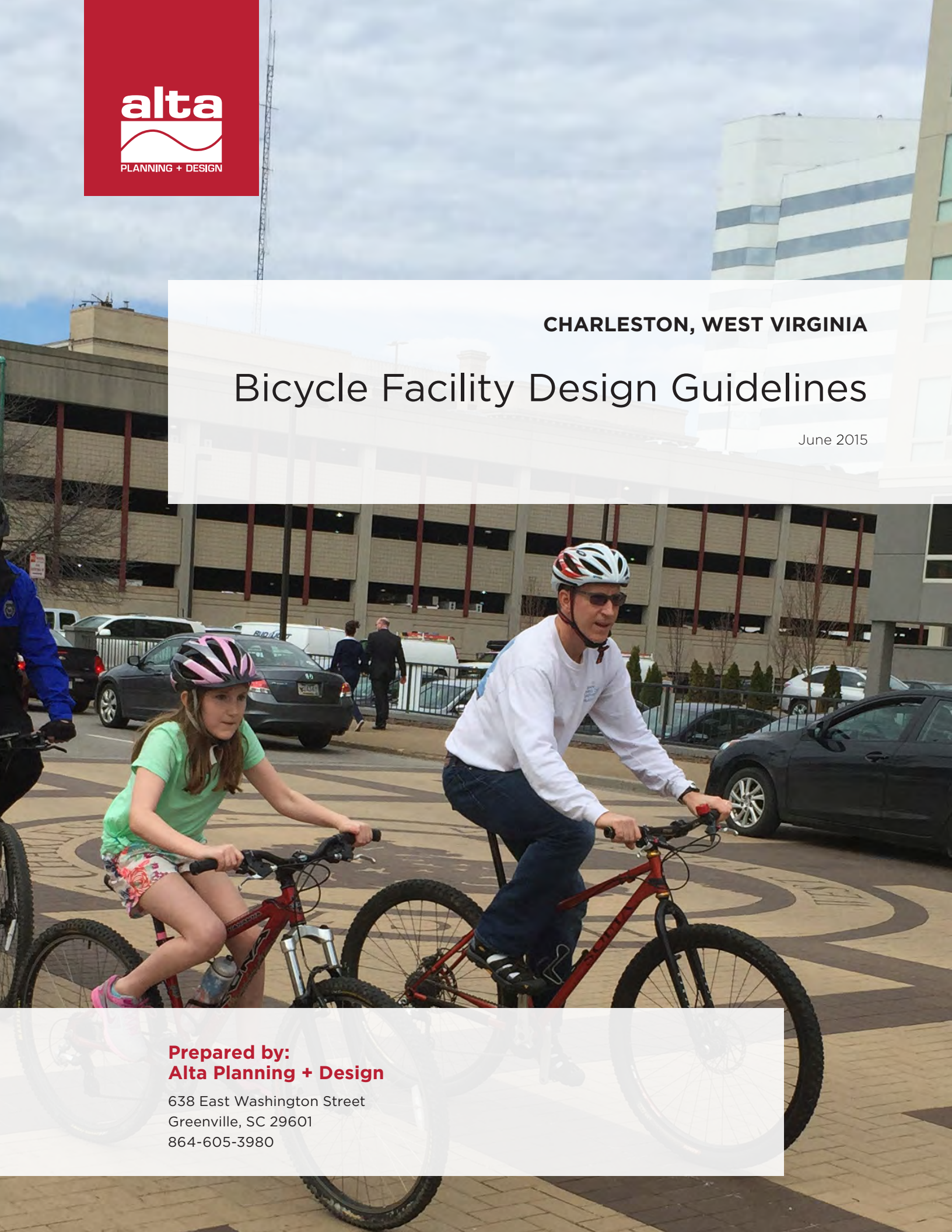

CHARLESTON, WEST VIRGINIA

Bicycle Facility Design Guidelines

June 2015

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Greenville, SC 29601
864-605-3980

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TABLE OF CONTENTS

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CONTEXT

CONTEXT

GUIDANCE BASIS

The sections that follow serve as an inventory of bicycle design treatments and provide guidelines for their development. The guidelines are not, however, a substitute for a more thorough evaluation by a landscape architect or engineer upon implementation of facility improvements. The following standards and guidelines are referred to in this guide.

National Guidance

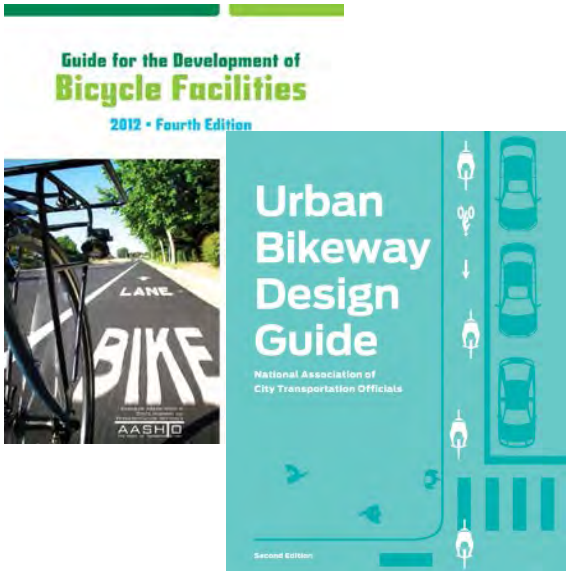
American Association of State Highway and Transportation Officials **(AASHTO) Guide for the Development of Bicycle Facilities (2013)**, updated in June 2012 provides guidance on dimensions, use, and layout of specific bicycle facilities.

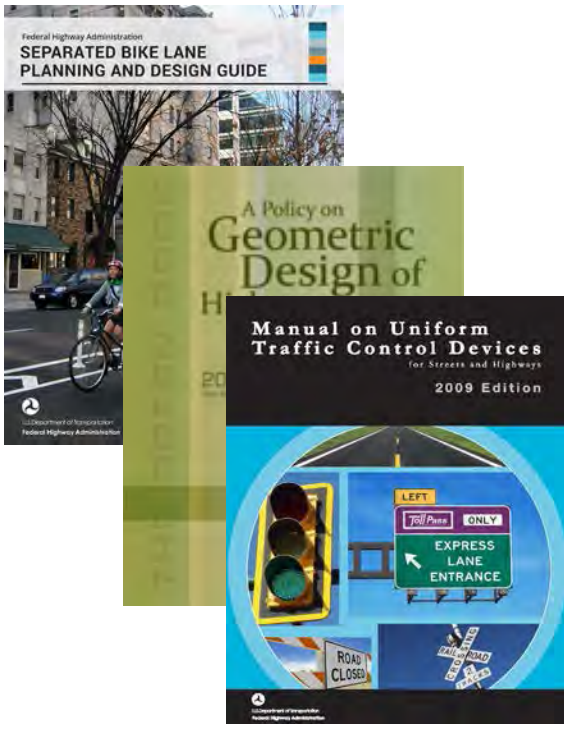
The National Association of City Transportation Officials' **(NACTO) Urban Bikeway Design Guide (2012)** is the newest publication of nationally recognized bikeway design standards, and offers guidance on the current state of the practice designs.

The Federal Highway Administration's (FHWA) **Separated Bike Lane Planning and Design Guide (2015)** provies federal endorsement of physically separated bike lanes and preferred design standards.

The 2011 **AASHTO A Policy on Geometric Design of Highways and Streets (2011)** commonly referred to as the "Green Book," contains the current design research and practices for highway and street geometric design.

FHWA's **Manual on Uniform Traffic Control Devices (MUTCD) (2009)** defines the standards used by road managers nationwide to install and maintain traffic control devices on all public streets, highways, bikeways, and private roads open to public traffic. The MUTCD is the primary source for guidance on lane striping requirements, signal warrants, and recommended signage and pavement markings.





CONTEXT

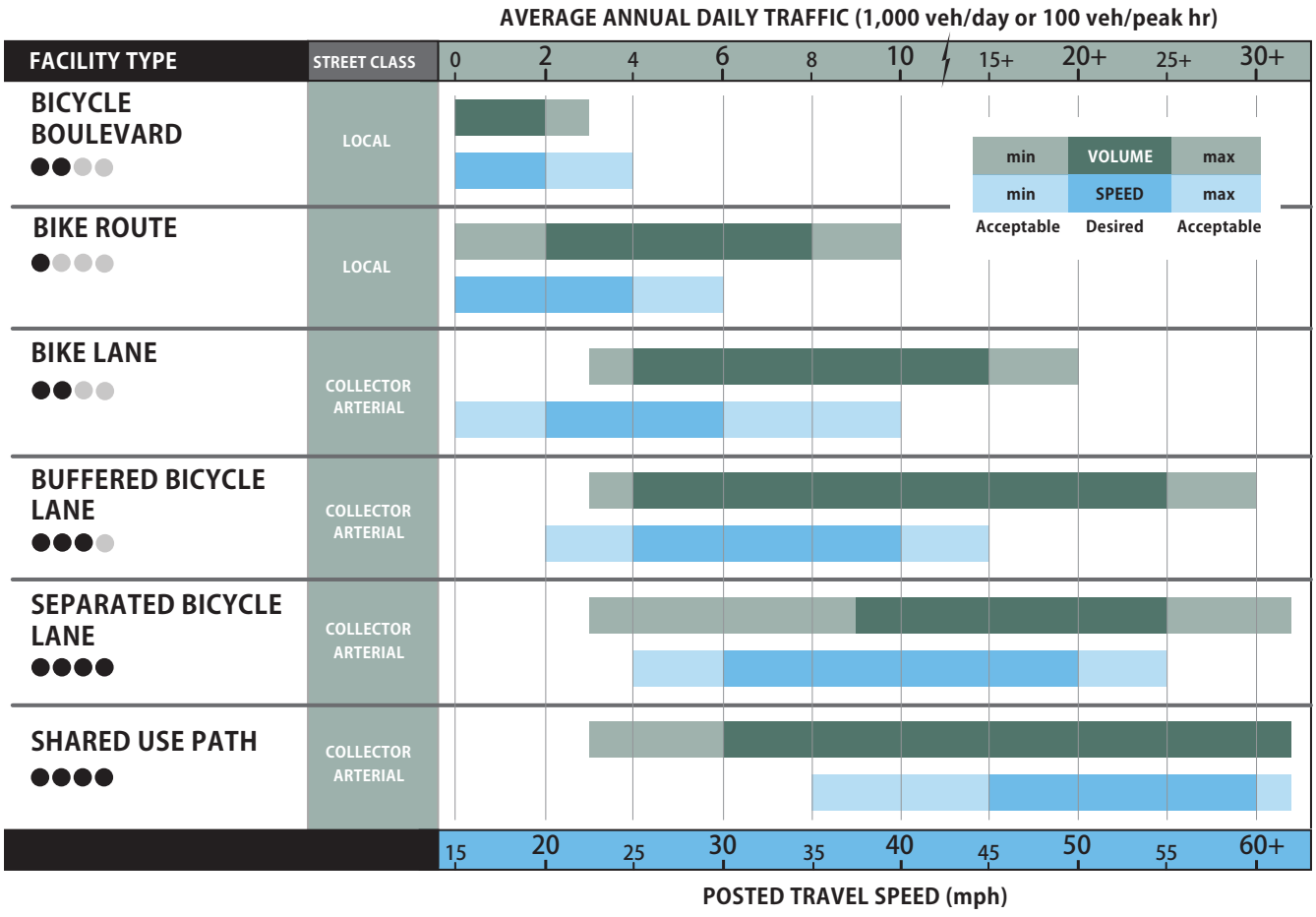
FACILITY SELECTION

Selecting the best bikeway facility type for a given roadway can be challenging, due to the range of factors that influence bicycle users' comfort and safety. There is a significant impact on cycling comfort when the speed differential between bicyclists and motor vehicle traffic is high and motor vehicle traffic volumes are high.

Facility Selection Table

As a starting point to identify a preferred facility, the chart below can be used to determine the recommended type of bikeway to be provided in particular roadway speed and volume situations. To use this chart, identify the appropriate daily traffic volume and travel speed on or the existing or proposed roadway, and locate the facility types indicated by those key variables.

Other factors beyond speed and volume which affect facility selection include traffic mix of automobiles and heavy vehicles, the presence of on-street parking, intersection density, surrounding land use, and roadway sight distance. These factors are not included in the facility selection chart below, but should always be considered in the facility selection and design process.



CONTEXT

BICYCLIST USER TYPE

The current AASHTO Guide to the Development of Bicycle Facilities encourages designers to identify their rider type based on the trip purpose (Recreational vs Transportation) and on the level of comfort and skill of the rider (Casual vs Experienced). An alternate framework for understanding the US population's relationship to transportation focused bicycling is illustrated in the figure below. Developed by planners in Portland, OR* and supported by research**, this classification identifies four categories to address varying attitudes towards bicycling in the US.

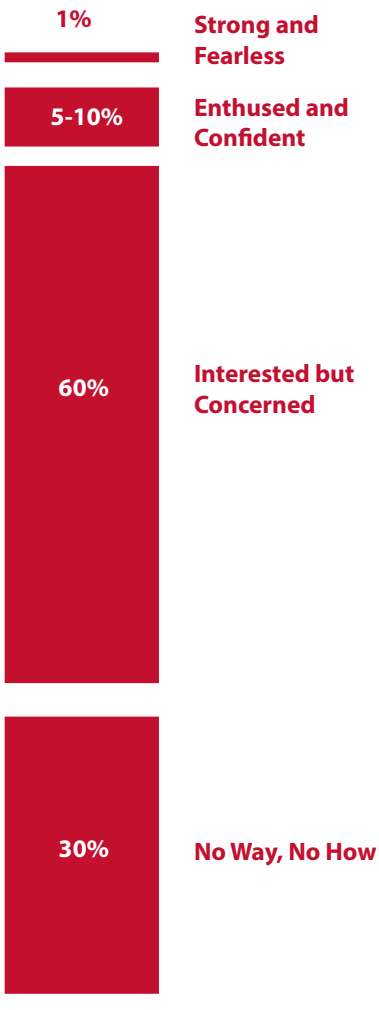
Four Types of Transportation Bicyclists

Strong and Fearless (approximately 1% of population) – Characterized by bicyclists that will typically ride anywhere regardless of roadway conditions or weather. These bicyclists can ride faster than other user types, prefer direct routes and will typically choose roadway connections -- even if shared with vehicles -- over separate bicycle facilities such as shared-use paths.

Enthused and Confident (5-10% of population) - This user group encompasses bicyclists who are fairly comfortable riding on all types of bikeways but usually choose low traffic streets or shared-use paths when available. These bicyclists may deviate from a more direct route in favor of a preferred facility type. This group includes all kinds of bicyclists such as commuters, recreationalists, racers and utilitarian bicyclists.

Interested but Concerned (approximately 60% of population) – This user type comprises the bulk of the cycling population and represents bicyclists who typically only ride a bicycle on low traffic streets or shared-use paths under favorable weather conditions. These bicyclists perceive significant barriers to their increased use of cycling, specifically traffic and other safety issues. These people may become "Enthused & Confident" with encouragement, education and experience.

No Way, No How (approximately 30% of population) – Persons in this category are not bicyclists, and perceive severe safety issues with riding in traffic. Some people in this group may eventually become more regular cyclists with time and education. A significant portion of these people will not ride a bicycle under any circumstances.



Typical Distribution of Bicyclist Types

* Roger Geller, City of Portland Bureau of Transportation. Four Types of Cyclists. http://www.portlandonline.com/transportation/index.cfm?&a=237507. 2009.

** Dill, J., McNeil, N. Four Types of Cyclists? Testing a Typology to Better Understand Bicycling Behavior and Potential. 2012.

CONTEXT

USER DESIGN DIMENSIONS

The purpose of this section is to provide the facility designer with an understanding of how bicyclists operate and how their bicycle influences that operation. Bicyclists, by nature, are much more affected by poor facility design, construction and maintenance practices than motor vehicle drivers.

Bicyclists lack the protection from the elements and roadway hazards provided by an automobile's structure and safety features. By understanding the unique characteristics and needs of bicyclists, a facility designer can provide quality facilities and minimize user risk.

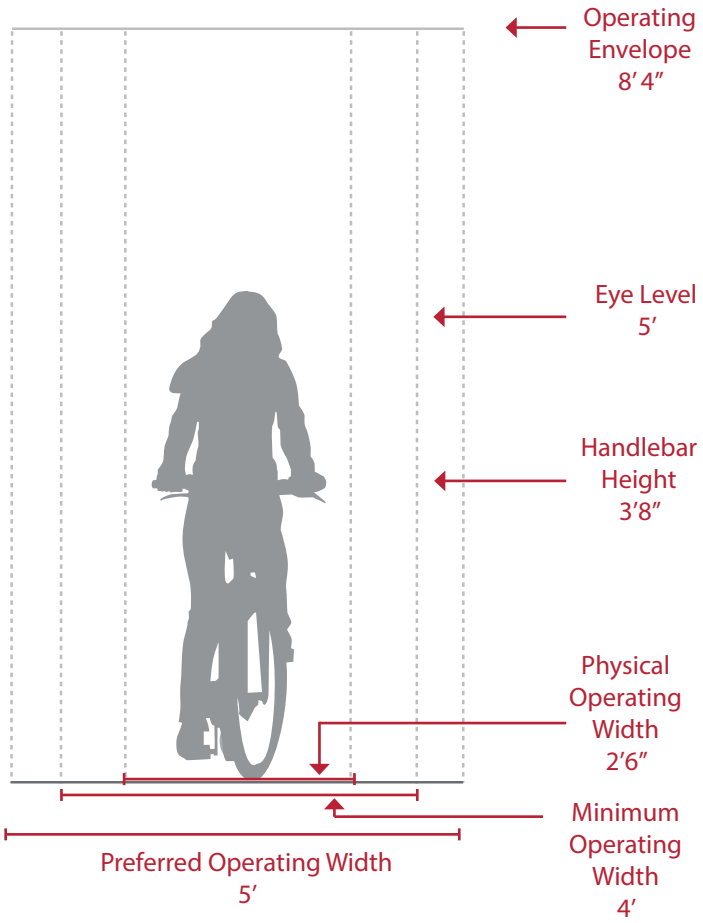
Bicycle as a Design Vehicle

Similar to motor vehicles, bicyclists and their bicycles exist in a variety of sizes and configurations. These variations occur in the types of vehicle (such as a conventional bicycle, a recumbent bicycle or a tricycle), and behavioral characteristics (such as the comfort level of the bicyclist). The design of a bikeway should consider reasonably expected bicycle types on the facility and utilize the appropriate dimensions.

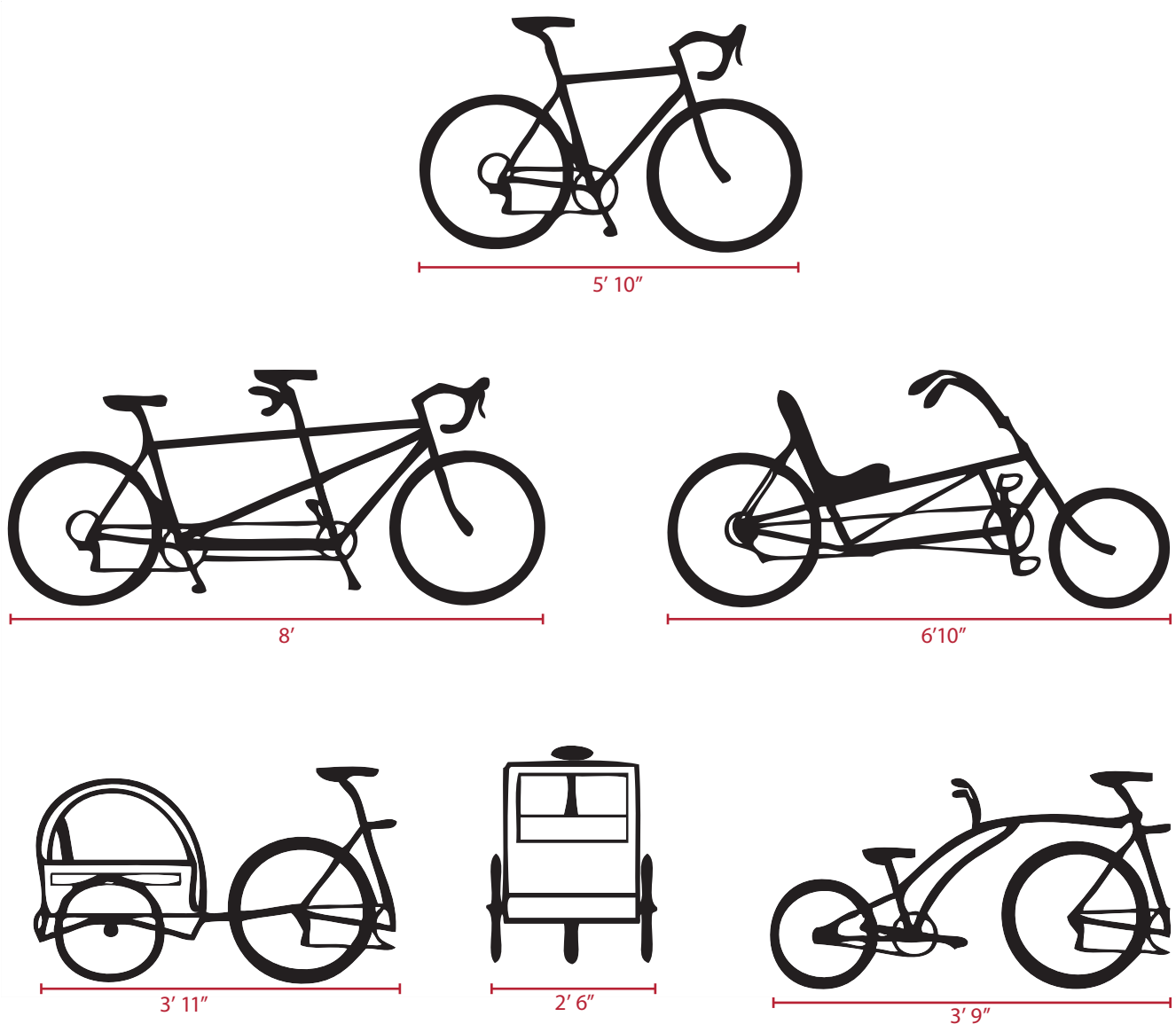
The figure to the right illustrates the operating space and physical dimensions of a typical adult bicyclist, which are the basis for typical facility design. Bicyclists require clear space to operate within a facility. This is why the minimum operating width is greater than the physical dimensions of the bicyclist. Bicyclists prefer five feet or more operating width, although four feet may be minimally acceptable.

In addition to the design dimensions of a typical bicycle, there are many other commonly used pedal-driven cycles and accessories to consider when planning and designing bicycle facilities. The most common types include tandem bicycles, recumbent bicycles, and trailer accessories. The figure to the left summarizes the typical dimensions for bicycle types.

Bicycle Rider - Typical Dimensions



Bicycle Design Vehicle - Typical Dimensions



Source: AASHTO *Guide for the Development of Bicycle Facilities*, 4th Edition

Design Speed Expectations

The expected speed that different types of bicyclists can maintain under various conditions also influences the design of facilities such as shared use paths. The table to the right provides typical bicyclist speeds for a variety of conditions.

Bicycle as Design Vehicle - Design Speed Expectations

Bicycle Type	Feature	Typical Speed
Upright Adult Bicyclist	Paved level surfacing	8-12 mph*
	Crossing Intersections	10 mph
	Downhill	30 mph
	Uphill	5 -12 mph
Recumbent Bicyclist	Paved level surfacing	18 mph

* Typical speed for causal riders per AASHTO 2013.

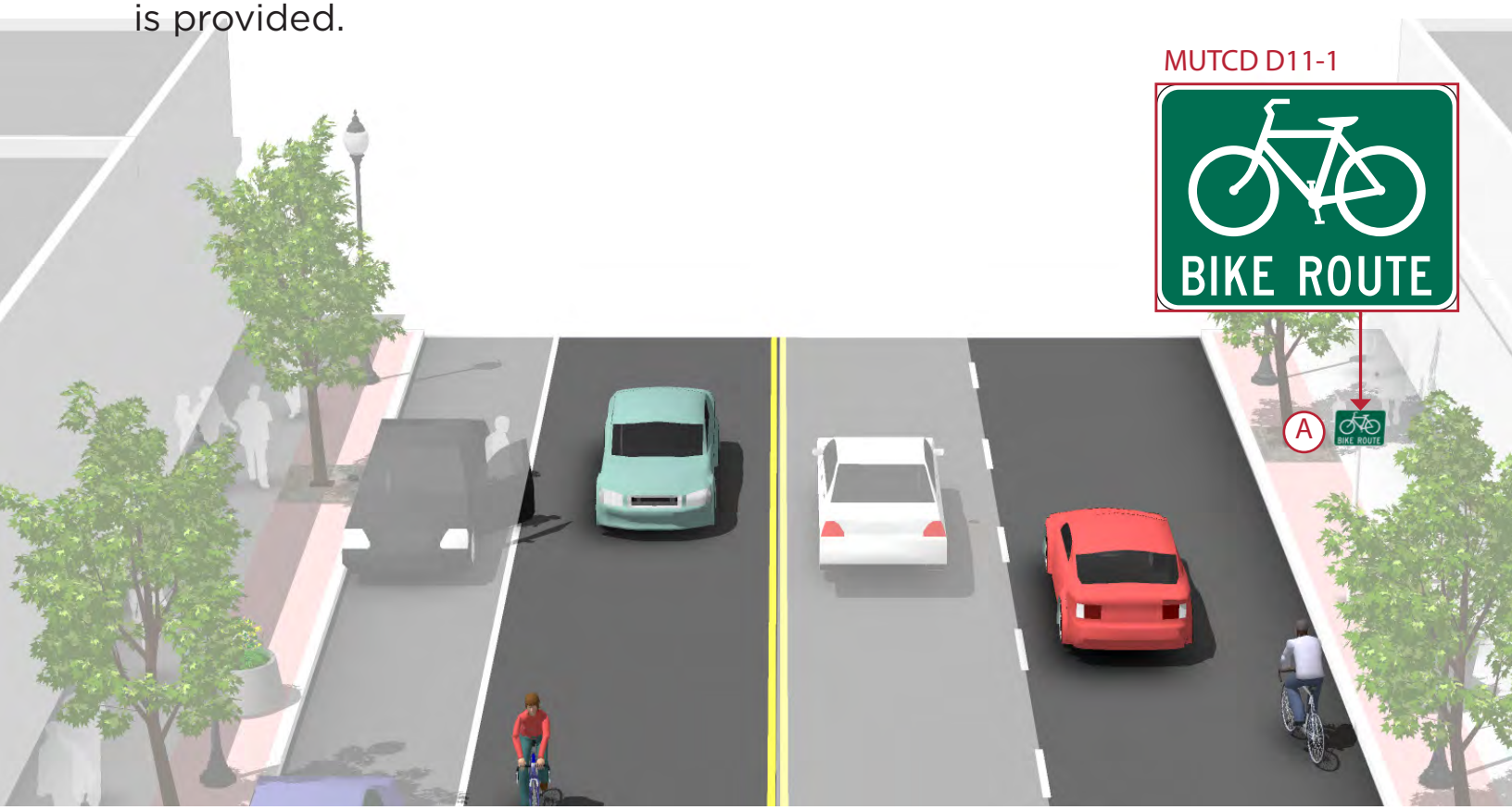
SHARED ROADWAYS

Photo: Richard Masoner Via Flickr (CC BY-SA 2.0)

SHARED ROADWAYS

SIGNED SHARED ROADWAY

Signed shared roadways are facilities shared with motor vehicles. A motor vehicle driver will usually have to cross over into the adjacent travel lane to pass a bicyclist, unless a wide outside lane or shoulder is provided.



Typical Application

- On low volume, low speed streets
- Used to provide continuity with other bicycle facilities (usually bike lanes).
- May be used on higher volume roads with wide outside lanes or shoulders. On these streets, signed shared roadways are not suitable for children or casual, less experienced bicyclists.

Design Features

Lane width varies depending on roadway configuration.

(A) Bike route signage (D11-1) should be applied at intervals frequent enough to keep bicyclists informed of changes in route direction and to remind motorists of the presence of bicyclists. Commonly, this includes placement at:

- Beginning or end of Bicycle Route.
- At major changes in direction or at intersections with other bicycle routes.
- At intervals along bicycle routes not to exceed ½ mile.

SHARED ROADWAYS

MARKED SHARED ROADWAY

A marked shared roadway is a general purpose travel lane marked with shared lane markings (SLM) used to encourage bicycle travel and proper positioning within the lane.

Typical Application

- May be used on streets with a posted speed limit of 35 mph or under, although vehicle speeds less than 30 mph is preferred.
- Used to provide continuity with other bicycle facilities (usually bike lanes).
- May be used on higher volume roads with wide outside lanes or shoulders. On these streets, signed shared roadways are not suitable for children or casual, less experienced bicyclists.

Design Features

(A) In constrained conditions, preferred placement is in the center of the travel lane to minimize wear and promote single file travel.

(B) On wide outside lanes with no parking (≥ 14 ft), place the marking 4 feet from edge of curb to promote bicycle travel to the right of motor vehicles.

- Minimum placement of SLM marking centerline is 11 feet from edge of curb where on-street parking is present. If parking lane is wider than 7.5 feet, the SLM should be moved further out accordingly.

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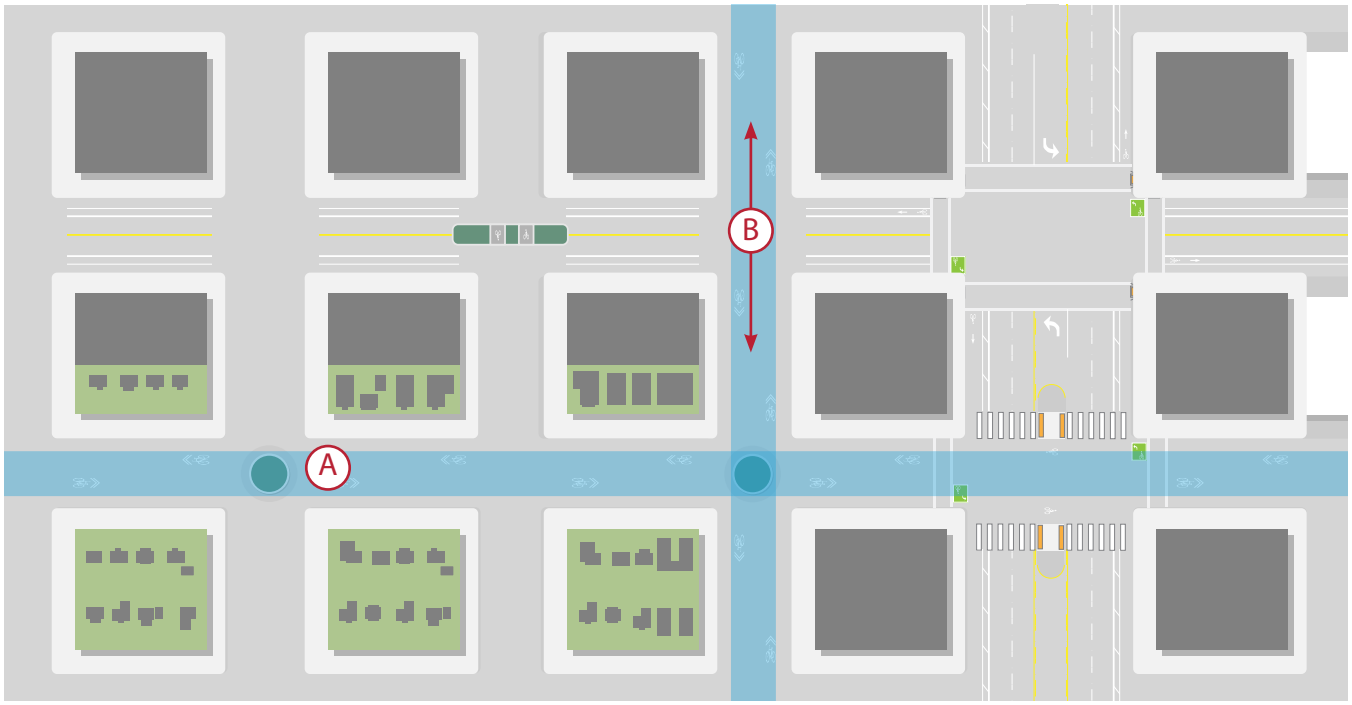
BIKE BOULEVARDS

BIKE BOULEVARDS

ROUTE SELECTION

Bike boulevards should be developed on streets that improve connectivity to key destinations and provide a direct route for bicyclists. Local streets with existing traffic calming, traffic diversions, or signalized crossings or major streets are good candidates, as they tend to be existing bicycle routes and have low motor vehicle speeds and volumes.



Typical Application

- Routes should be parallel with and in close proximity to major thoroughfares
- Routes should closely follow a desire line for bicycle travel that is ideally long and relatively continuous (2-5 miles).
- Streets with travel speeds at 25 mph or less and with traffic volumes of fewer than 3,000 vehicles per day. These conditions should either exist or be established with speed and volume management techniques.

Design Features

(A) Speed and volume management should be used to create appropriate conditions on routes that do not meet design thresholds.

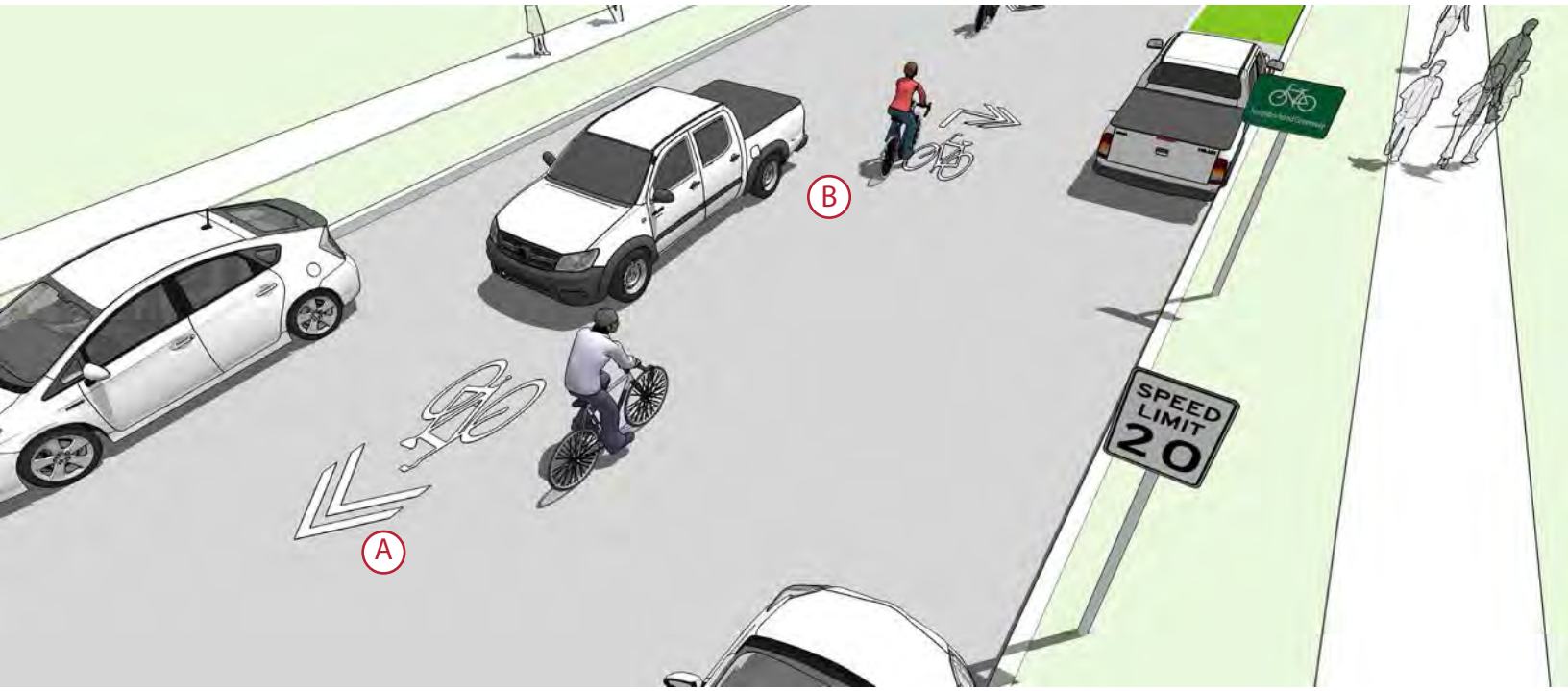
(B) Use of streets that parallel major streets can discourage non-local motor vehicle traffic without significantly impacting motorists.

- Can benefit pedestrians and other users through crossing improvements, wayfinding, landscaping, and reduced motor vehicle speeds and volumes.

BIKE BOULEVARDS

SIGNS & PAVEMENT MARKINGS

Signs and pavement markings are the minimum treatments necessary to designate a street as a neighborhood bikeway. Together, they visibly designate a roadway to both bicyclists and motorists. Signs, and in some cases pavement markings, provide wayfinding to help bicyclists remain on the designated route.



Typical Application

- Pavement markings identify the route and can guide users through jogs in the route.
- Signs and markings differentiate bicycle boulevards from other local streets, reminding people driving to watch for bicyclists.
- Wayfinding signs displaying destinations, distances, and "riding time" can dispel common misperceptions about time and distance.

Design Features

(A) Place symbols every 150-300 feet along a bike boulevard, as well as after every intersection.

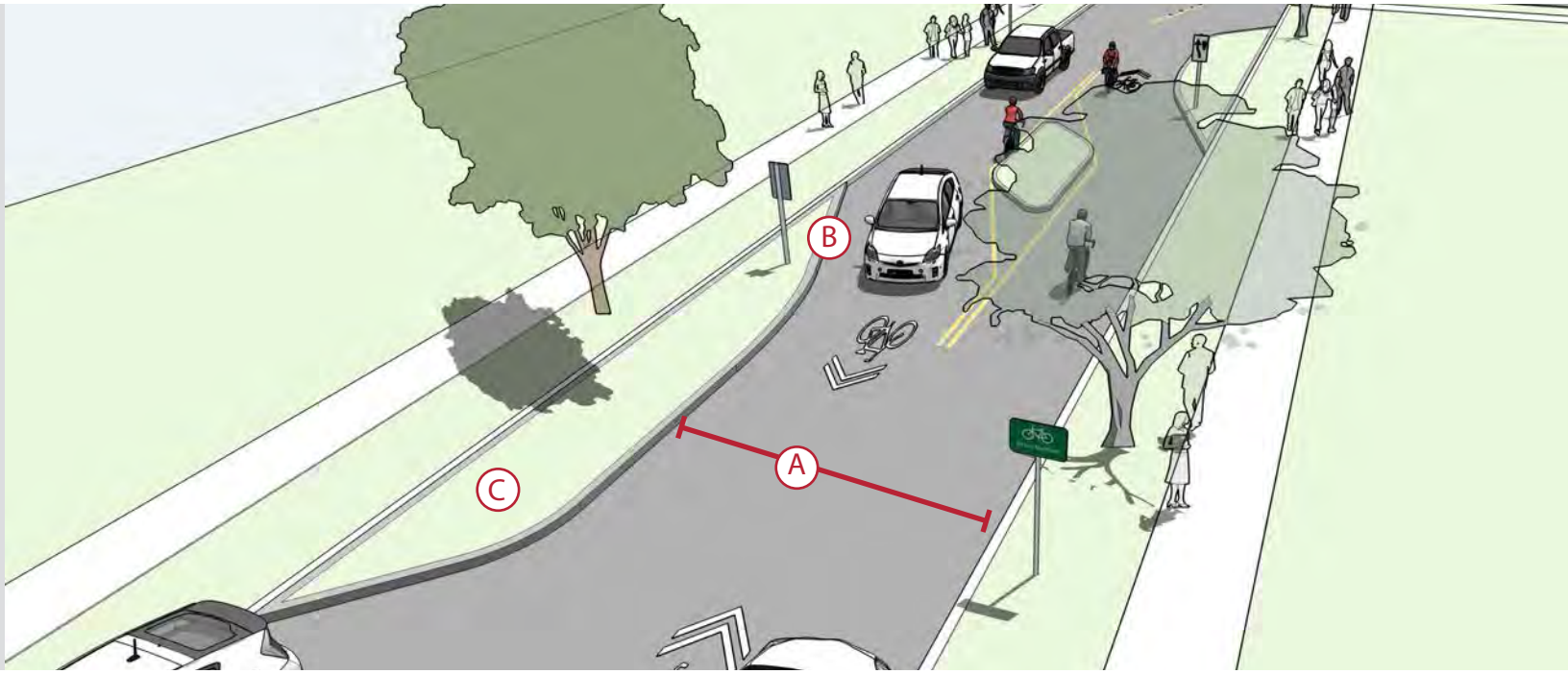
(B) On narrow streets where a motor vehicle cannot pass a bicyclists within one lane of traffic, place markings in the center of the travel lane.

- Modified street signs identify and brand the route without introducing a new sign.
- Shared lane markings are a standard marking for shared lane conditions. Some cities use custom markings to identify their neighborhood bikeway network.

BIKE BOULEVARD

SPEED MANAGEMENT

Traffic calming devices cause drivers to slow down by constricting the roadway space or by requiring careful maneuvering. Such measures may reduce the design speed of a street, and can be used in conjunction with reduced speed limits to reinforce the expectation of lowered speeds.



Typical Application

- On bike boulevards where a reduction of vehicle speeds is desired and where improved conditions for bicyclists, pedestrians and residents along the route is desired.
- Neighborhood bikeways should have a maximum posted speed of 25 mph. Use traffic calming to maintain an 85th percentile speed below 22 mph.

Design Features

(A) Maintain a minimum clear width of 14 feet with a constricted length of at least 20 feet in the direction of travel.

(B) Traffic calming should be designed to minimize impacts to street cleaning equipment.

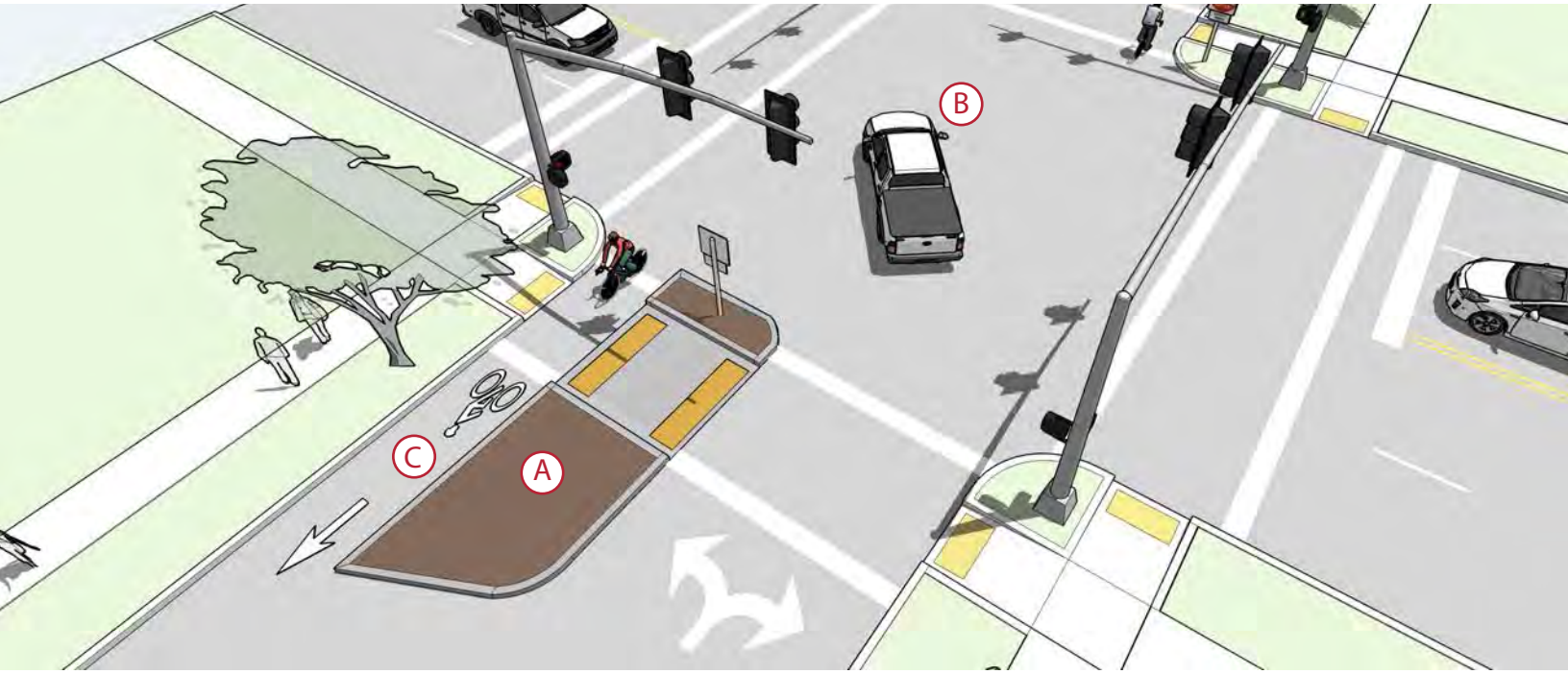
(C) Vegetation along the route should be regularly trimmed to maintain visibility and attractiveness.

- Horizontal speed control measures should not infringe on bicycle space. Where possible, provide a bicycle route outside of the element so bicyclists can avoid having to merge into traffic at a narrow pinch point.

BIKE BOULEVARD

VOLUME MANAGEMENT

Volume management measures reduce or discourage thru traffic on neighborhood bikeways by physically or operationally reconfiguring corridors and intersections along the route. Lower vehicle volumes increase bicyclists' comfort and reduce the number of potential conflicts. Implement volume control treatments based on the context of the neighborhood bikeway.



Typical Application

- Volume management techniques establish and reinforce bicycle priority by restricting vehicle through movements.
- On bike boulevards where a reduction of vehicle volumes down to 1,500 – 3,000 cars per day is desired and where improved conditions for bicyclists, pedestrians and residents along the route is desired.
- Where design treatments cannot reduce volumes below 3,000 cars per day, provide a on-street or physically separated bike lane.

Design Features

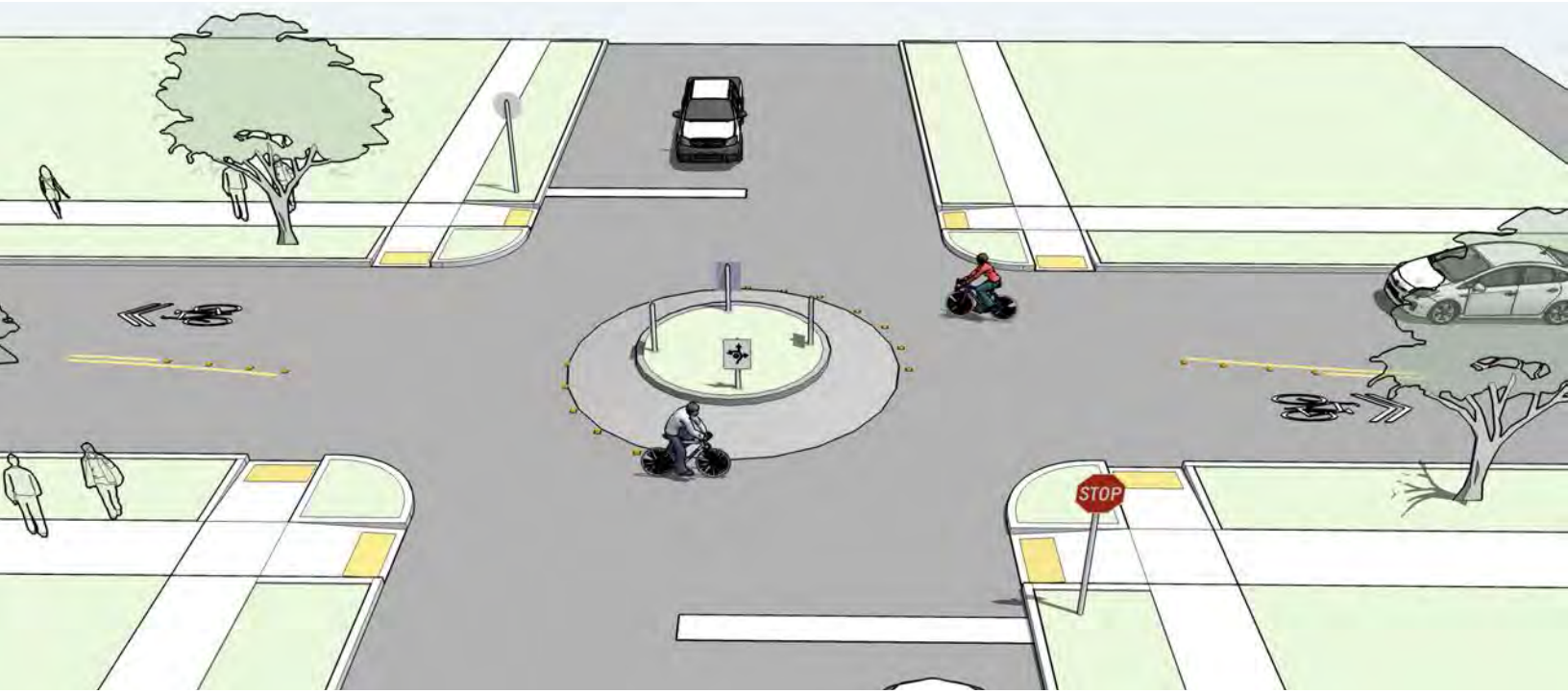
(A) While volume management methods are designed to restrict motor vehicle access, bicyclist passage should always (B) be allowed.

- May be combined with **Major Intersection Treatments**. (C)
- Volume control measures should not prevent or slow down through bicycle travel. Markings should identify bicycle pass-through areas while restricting motor vehicle access.

BIKE BOULEVARD

MINOR INTERSECTION CROSSINGS

Treatments at minor roadway intersections are designed to improve the visibility of a neighborhood bikeway, raise awareness of motorists on the cross-street that they are likely to encounter bicyclists, and enhance safety for all road users.



Typical Application

- Where bike boulevards must cross minor streets.
- On the bicycle boulevard, the majority of intersections with minor roadways should stop-control cross traffic to minimize bicyclist delay. This will maximize bicycling efficiency.
- Neighborhood bikeways should have fewer stops or delays than other local streets. A typical bicycle trip of 30 minutes can increase to 40 minutes if there is a STOP sign at every block. Mini traffic circles may be used to control intersection priority and slow motor vehicles.

Design Features

- Traffic circles are a type of horizontal traffic calming that can be used at minor street intersections. Traffic circles reduce conflict potential and severity while providing traffic calming to the corridor.
- Curb extensions can be used to move bicyclists closer to the centerline to improve visibility and encourage motorists to let them cross.
- If a stop sign is present on the neighborhood bikeway, a second stop bar for bicyclists can be placed closer to the centerline of the cross street than the motorists' stop bar to increase the visibility of bicyclists waiting to cross the street.

BIKE BOULEVARD

MAJOR INTERSECTION CROSSINGS

The quality of treatments at major street crossings can significantly affect a bicyclist's choice to use a neighborhood bikeway, as opposed to another road that provides a crossing treatment.

Typical Application

- Where bike boulevards must cross major streets. The quality of neighborhood bikeways are often compromised by the comfort of these crossings.
- Without treatments for bicyclists, these intersections can become major barriers along the neighborhood bikeway and negatively impact safety.

Design Features

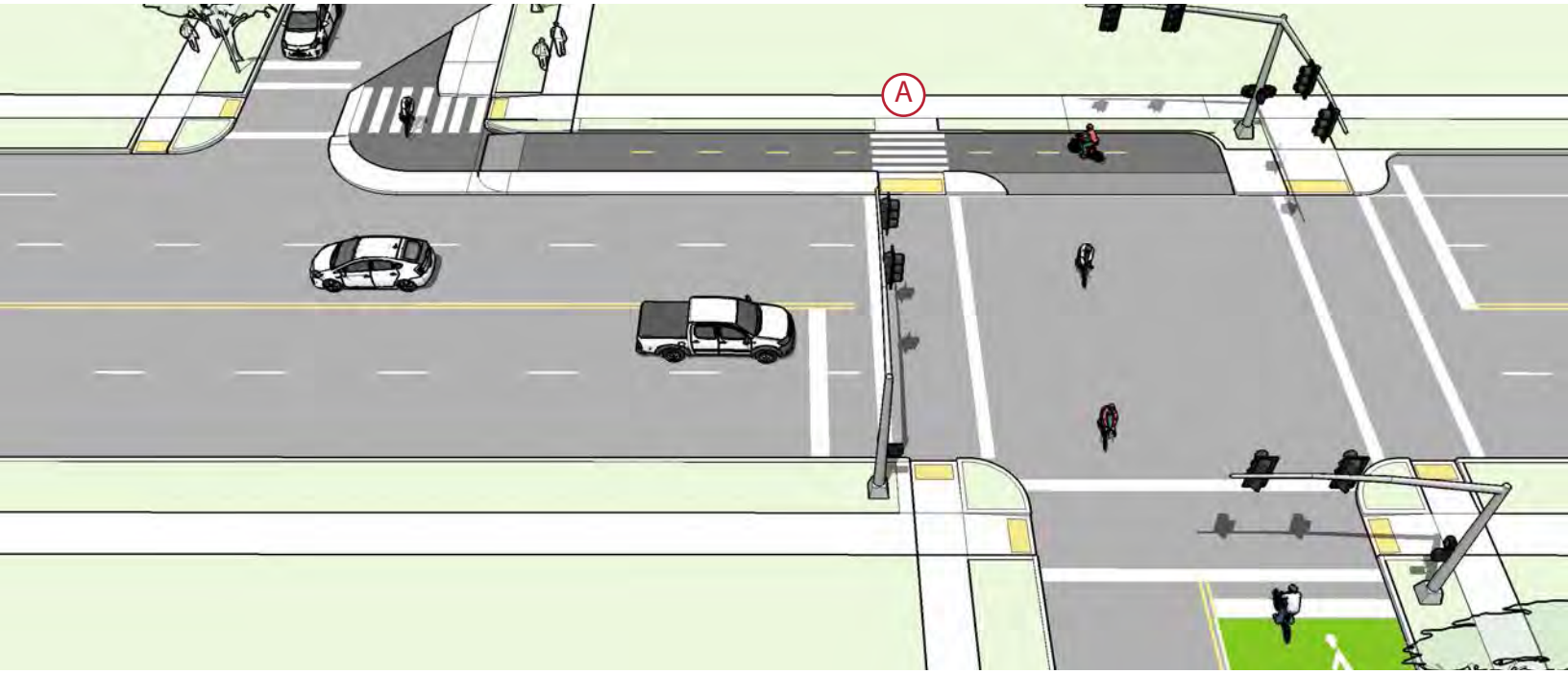
(A) **Hybrid beacons**, **active warning beacons** and **bicycle signals** can facilitate bicyclists crossing a busy street on which cross-traffic does not stop.

- **Bike boxes** increase bicyclist visibility to motorists and reduce the danger of right "hooks" by providing a space for bicyclists to wait at signalized intersections.
- **Median islands** provided at uncontrolled intersections of neighborhood bikeways and major streets allow bicyclists to cross one direction of traffic at a time as gaps in traffic occur.

BIKE BOULEVARD

OFF-SET INTERSECTION CROSSINGS

Off-set intersections can be challenging for bicyclists who are required to briefly travel along the busier cross street in order to continue along the bike boulevard. Because bike boulevards are located on local streets, the route is often discontinuous. Wayfinding and pavement markings assist bicyclists with remaining on the route.



Typical Application

- Where bike boulevards must be routed through off-set or skewed intersections.
- Where a cyclist must travel on a busier street than the bike boulevard, in order to continue riding on the route.
- Appropriate treatments depend on volume of traffic including turning volumes, traffic speeds and the type of bicyclist using the crossing.

Design Features

(A) A **two-way separated bike lane** can be provided on one side of a busy street to connect neighborhood bikeway segments. This maneuver may be signalized on one side.

- **Bicycle left-turn lanes** can be painted where a neighborhood bikeway is offset to the right on a street that has sufficient traffic gaps. Bicyclists cross one direction of traffic and wait in a protected space for a gap in the other direction. The bike turn pockets should be at least 4 feet wide, with a total of 11 feet for both turn pockets and center striping.

ON-STREET BIKE LANES

A LANE OF YOUR OWN

Designated exclusively for bicycle travel, on-street bike lanes are distinct from vehicle travel lanes by striping, and can include pavement stencils and other treatments. Separated bikeways are most appropriate on arterial and collector streets where higher traffic volumes and speeds warrant greater separation.

Separated bikeways can increase safety and promote proper riding by:

- Defining road space for bicyclists and motorists, reducing the possibility that motorists will stray into the bicyclists' path.
- Discouraging bicyclists from riding on the sidewalk.
- Reducing the incidence of wrong way riding.
- Reminding motorists that bicyclists have a right to the road.

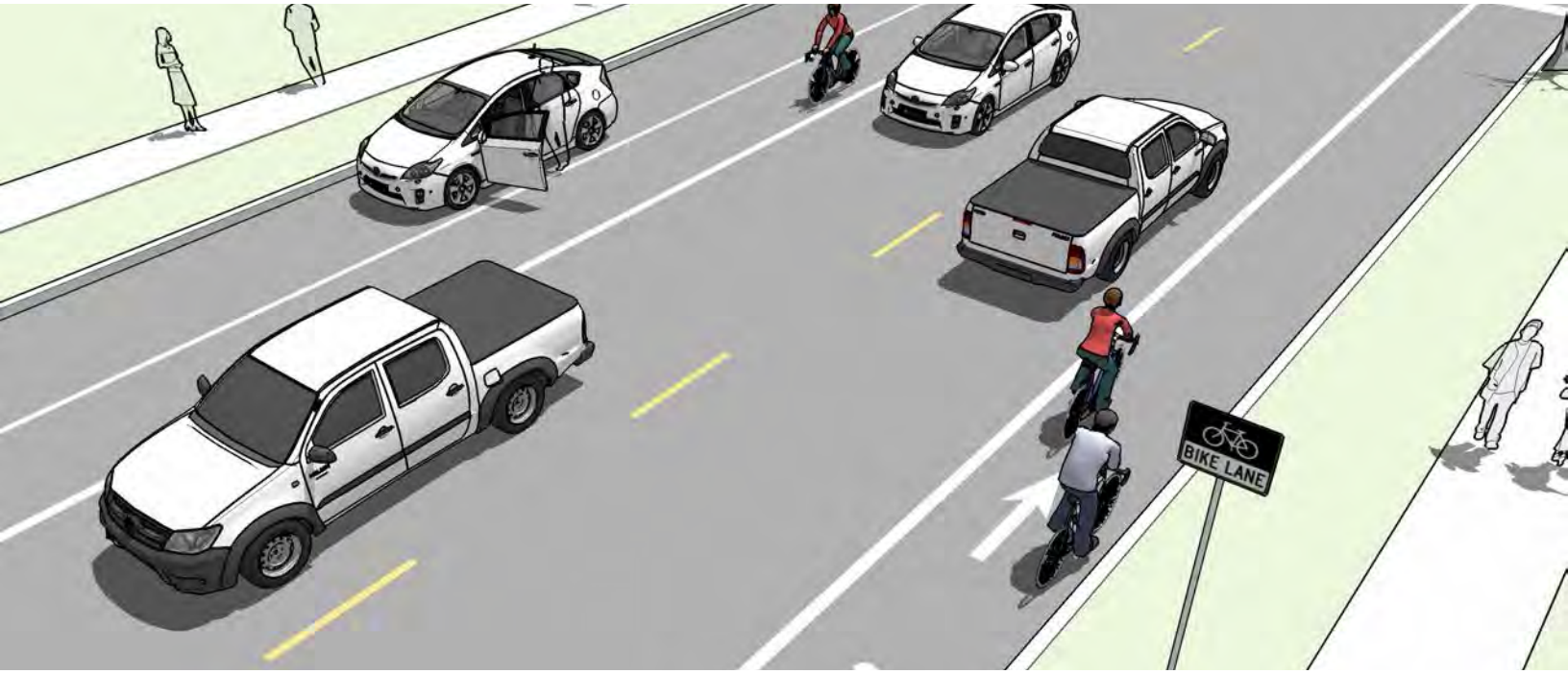
THE BETTER BIKE LANE

Recent innovations in bike lane designs provide experience and design features focused on reducing or removing "door zone" risks.

ON-STREET BIKE LANES

BICYCLE LANES

On-street bike lanes designate an exclusive space for bicyclists through the use of pavement markings and signage. The bike lane is located directly adjacent to motor vehicle travel lanes and is used in the same direction as motor vehicle traffic. Bike lanes are typically on the right side of the street, between the adjacent travel lane and curb, road edge or parking lane.



Typical Application

- Streets with moderate volumes ≥ 6,000 ADT (≥ 3,000 preferred).
- Streets with moderate speeds ≥ 25 mph.
- Appropriate for skilled adult riders on most streets.
- May be appropriate for children when configured as 6+ ft wide lanes on lower-speed, lower-volume streets with one lane in each.

Design Features

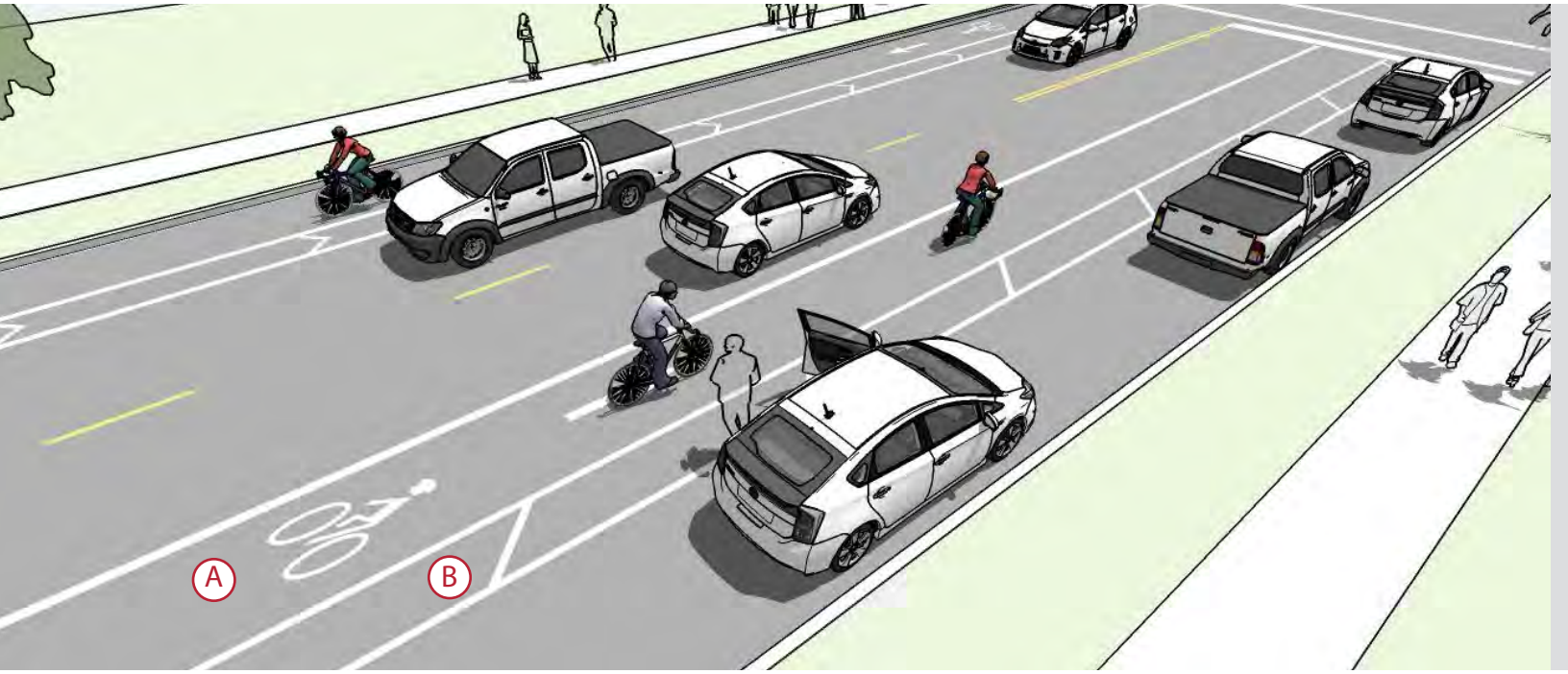
(A) 6 foot width preferred, particularly adjacent to on-street parking.

- 5 foot minimum width when adjacent to curb and gutter or 3 feet more than the gutter pan width if the gutter pan is wider than 2 feet.
- Widths greater than 7 ft may encourage motor vehicle use of bike lanes.

ON-STREET BIKE LANES

BUFFERED BICYCLE LANES

Buffered bike lanes are conventional bicycle lanes paired with a designated buffer space, separating the bicycle lane from the adjacent motor vehicle travel lane and/or parking lane.



Typical Application

- Anywhere a conventional bike lane is being considered.
- On streets with high speeds and high volumes or high truck volumes.
- On streets with extra lanes or lane width.

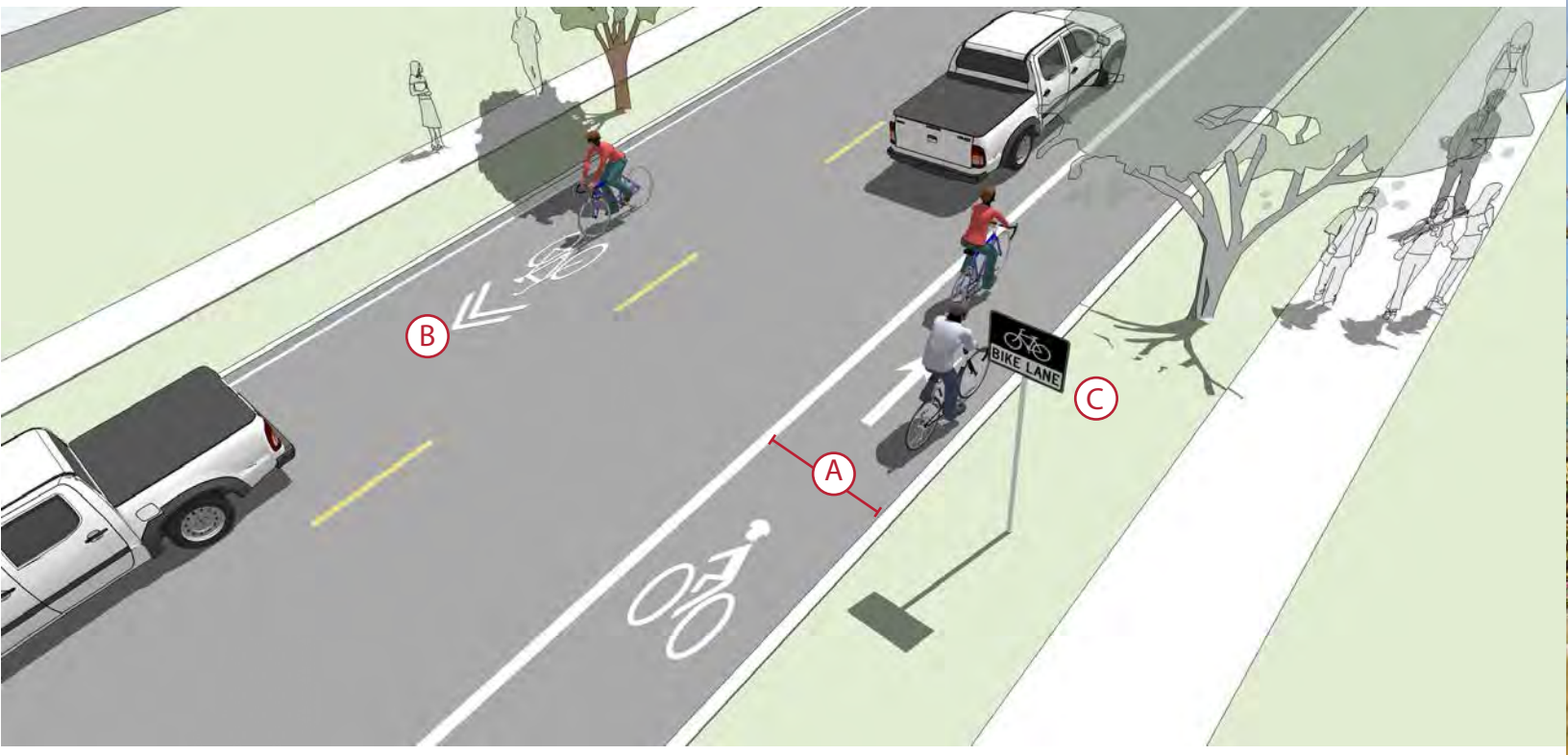
Design Features

- (A) The minimum bicycle travel area (not including buffer) is 5 feet wide.
- (B) Buffers should be at least 2 feet wide. If buffer area is 4 feet or wider, white chevron or diagonal markings may be used.
- For clarity in potential conflict zones, such as driveways or minor street crossings, consider using a dotted line.
- There is no standard for whether the buffer is configured on the parking side, the travel side, or a combination of both.

ON-STREET BIKE LANES

UPHILL BIKE CLIMBING LANE

Uphill bike lanes (also known as “climbing lanes”) enable motorists to safely pass slower-speed bicyclists, thereby improving conditions for both travel modes.



Typical Application

- On streets with shared road bicycle facilities but no bike lanes, where a bicycle must travel uphill
- Where greater distance between motor vehicles and adjacent bicyclists is desired.

Design Features

(A) Uphill bike lanes should be 6-7 feet wide (wider lanes are preferred because extra maneuvering room on steep grades can benefit bicyclists).

(B) Can be combined with shared lane markings for downhill bicyclists who can more closely match prevailing traffic speeds.

(C) May also include a Bike Lane sign (MUTCD R3-17).

SEPARATED BIKE LANES

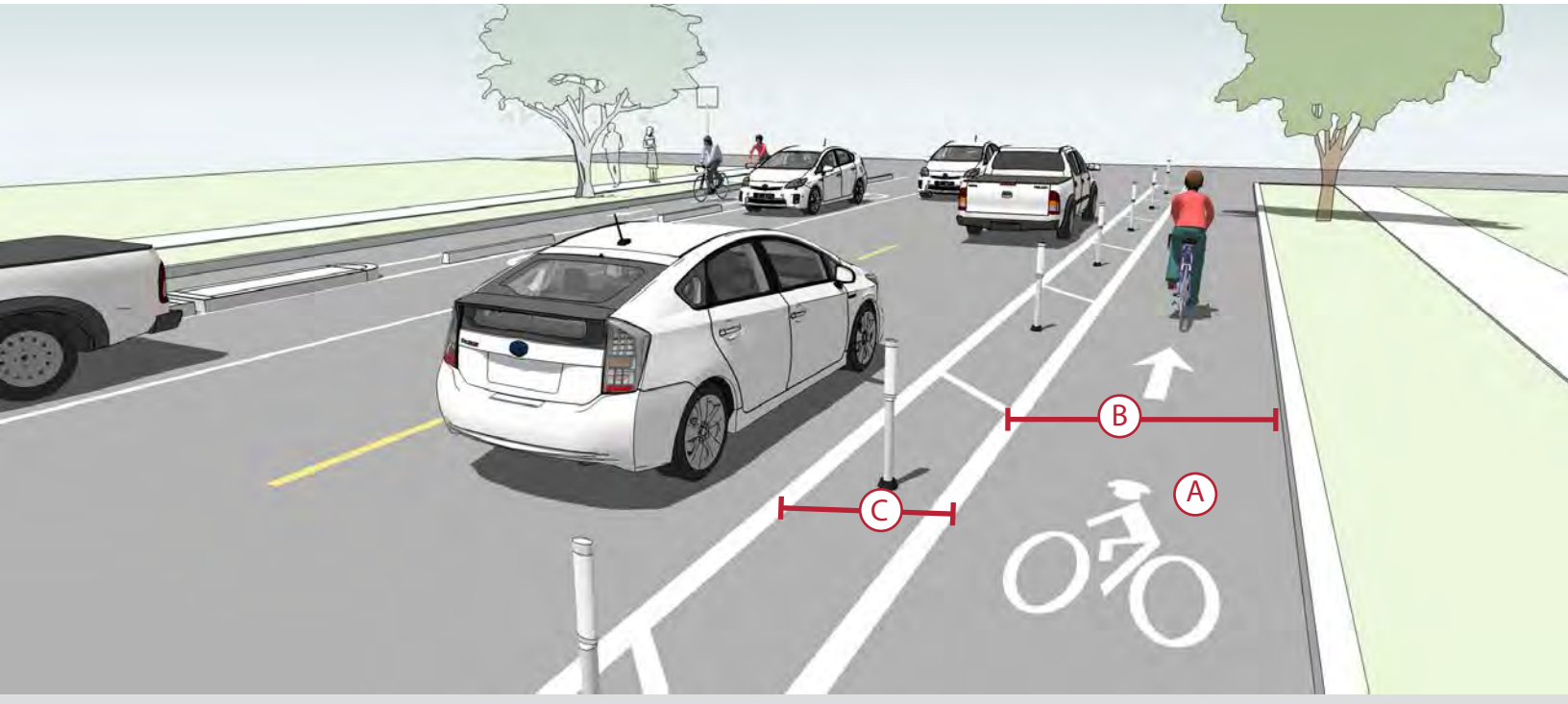
PHYSICAL SEPARATION MATTERS

A separated bike lane is an exclusive bike facility that combines the user experience of a separated path with the on-street infrastructure of a on-street bike lane. A separated bicycle lane is physically separated from motor traffic by a vertical element and distinct from the sidewalk. In situations where on-street parking is allowed, cycle tracks are located between the parking and the sidewalk.

SEPARATED BIKE LANES

ONE WAY SEPARATED BIKE LANES

A one way cycle track provides protection to cyclists through physical barriers that can include bollards, parking, a planter strip, an extruded curb or on-street parking. Cycle tracks may be at street level or raised to the level of the adjacent sidewalk.



Typical Application

- Streets with high motor vehicle volumes and/or speeds and high bicycle volumes.
- Streets for which conflicts at intersections can be effectively mitigated using parking lane setbacks, bicycle markings through the intersection, and other signalized intersection treatments.
- Appropriate for most riders on most streets, although caution should be used when approaching intersections or other conflict areas.

Design Features

(A) Pavement markings, symbols and/or arrow markings must be placed at the beginning of the separated bike lane and at intervals along the facility.

(B) 7 foot width preferred (5 foot minimum).

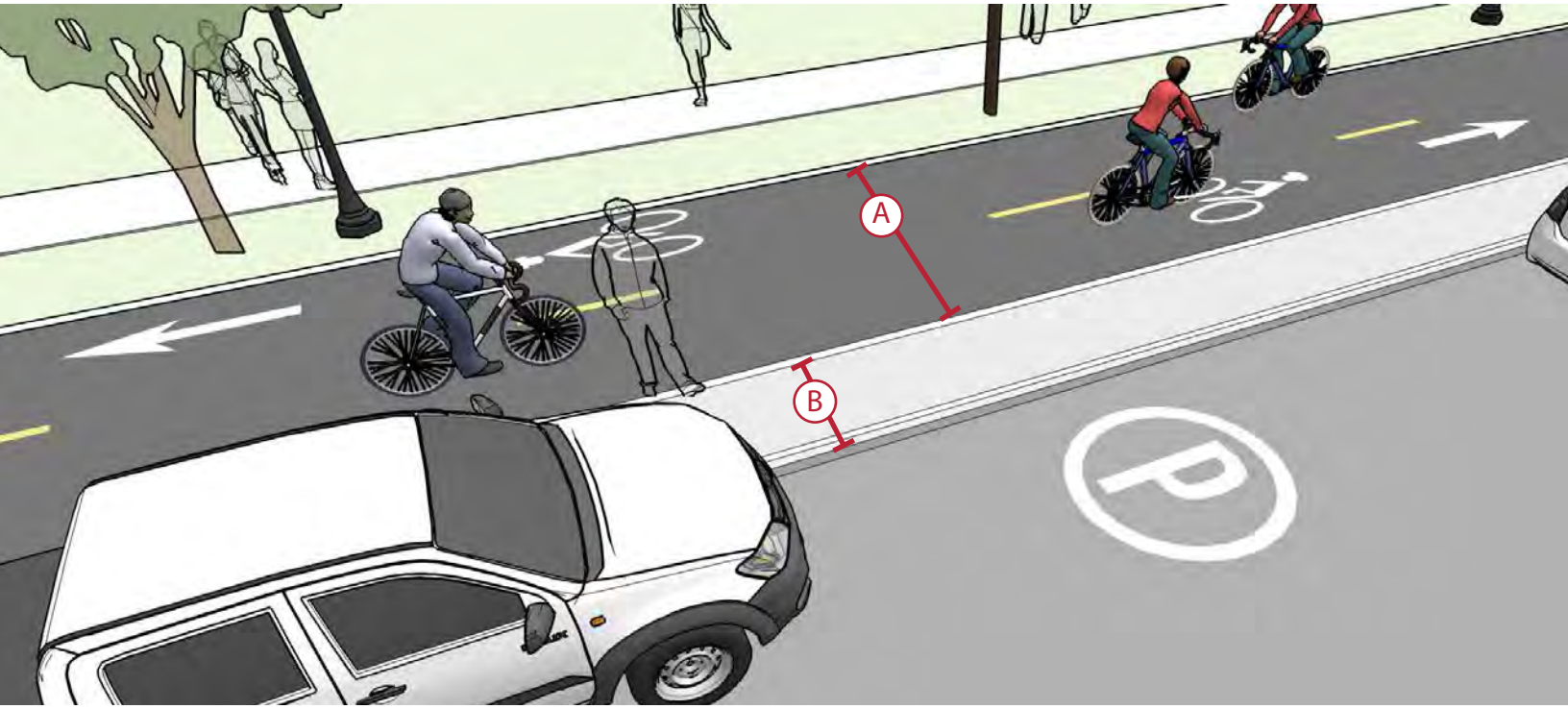
(C) 3 foot minimum buffer width adjacent to parking. 18 inch minimum adjacent to travel lanes **(NACTO, 2012).** Channelizing devices should be placed in the buffer area.

- If buffer area is 4 feet or wider, white chevron or diagonal markings should be used

SEPARATED BIKE LANES

TWO-WAY SEPARATED BIKE LANES

Two-way cycle tracks are bicycle facilities that allow bicycle movement in both directions on one side of the road. Two-way separated bicycle lanes share some of the same design characteristics as one-way separated bicycle lanes, but may require additional considerations at driveway and side-street crossings.



Typical Application

- Works best on the left side of one-way streets.
- Streets with high motor vehicle volumes and/or speeds.
- Streets with high bicycle volumes.
- Streets with a high incidence of wrong-way bicycle riding.
- Streets with few conflicts such as driveways or cross-streets on one side of the street.
- Streets that connect to shared-use paths.

Design Features

A 12 foot operating width preferred (10 ft minimum) width for two-way facility.

- In constrained an 8 foot minimum operating width may be considered.

B Adjacent to on-street parking a 3 foot minimum width channelized buffer or island shall be provided to accommodate opening doors. **(NACTO, 2012)**.

- Separation may be narrower than 5 foot separation may be permitted if physical barrier separation is present. **(AASHTO, 2013)**
- Additional signalization and signs may be necessary to manage conflicts.

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INTERSECTION TREATMENTS

Intersections are junctions at which different modes of transportation meet and facilities overlap. An intersection facilitates the interchange between bicyclists, motorists, pedestrians and other modes in order to advance traffic flow in a safe and efficient manner. Designs for intersections with bicycle facilities should reduce conflict between bicyclists and motor vehicles by heightening the level of visibility, denoting clear right-of-way and facilitating eye contact and awareness with other modes.

INTERSECTION TREATMENTS

BIKE LANES AT ADDED RIGHT TURN LANES

The appropriate treatment at right turn only lanes is to introduce an added turn lane to the outside of the bicycle lane. The area where people driving must weave across the bicycle lane should be marked with dotted lines and dotted green pavement to identify the potential conflict areas. Signage should indicate that motorists must yield to bicyclists through the conflict area.

Typical Application

- Streets with right-turn lanes and right side bike lanes.
- Streets with left-turn lanes and left side bike lanes.

Design Features

- Mark inside line with 6” stripe.
- Continue existing bike lane width; standard width of 5 to 6 feet (4 feet in constrained locations.)
- Use R4-4 BEGIN RIGHT TURN LANE YIELD TO BIKES signage to indicate that motorists should yield to bicyclists through the conflict area.
- Consider using colored in the conflict areas to promote visibility of the dashed weaving area.

INTERSECTION TREATMENTS

COLORED BICYCLE LANES

Colored pavement within a bicycle lane may be used to increase the visibility of the bicycle facility, raise awareness of the potential to encounter bicyclists and reinforce priority of bicyclists in conflict areas.

Typical Application

- Within a weaving or conflict area to identify the potential for bicyclist and motorist interactions and assert bicyclist priority.
- Across intersections, driveways and Stop or Yield-controlled cross-streets.

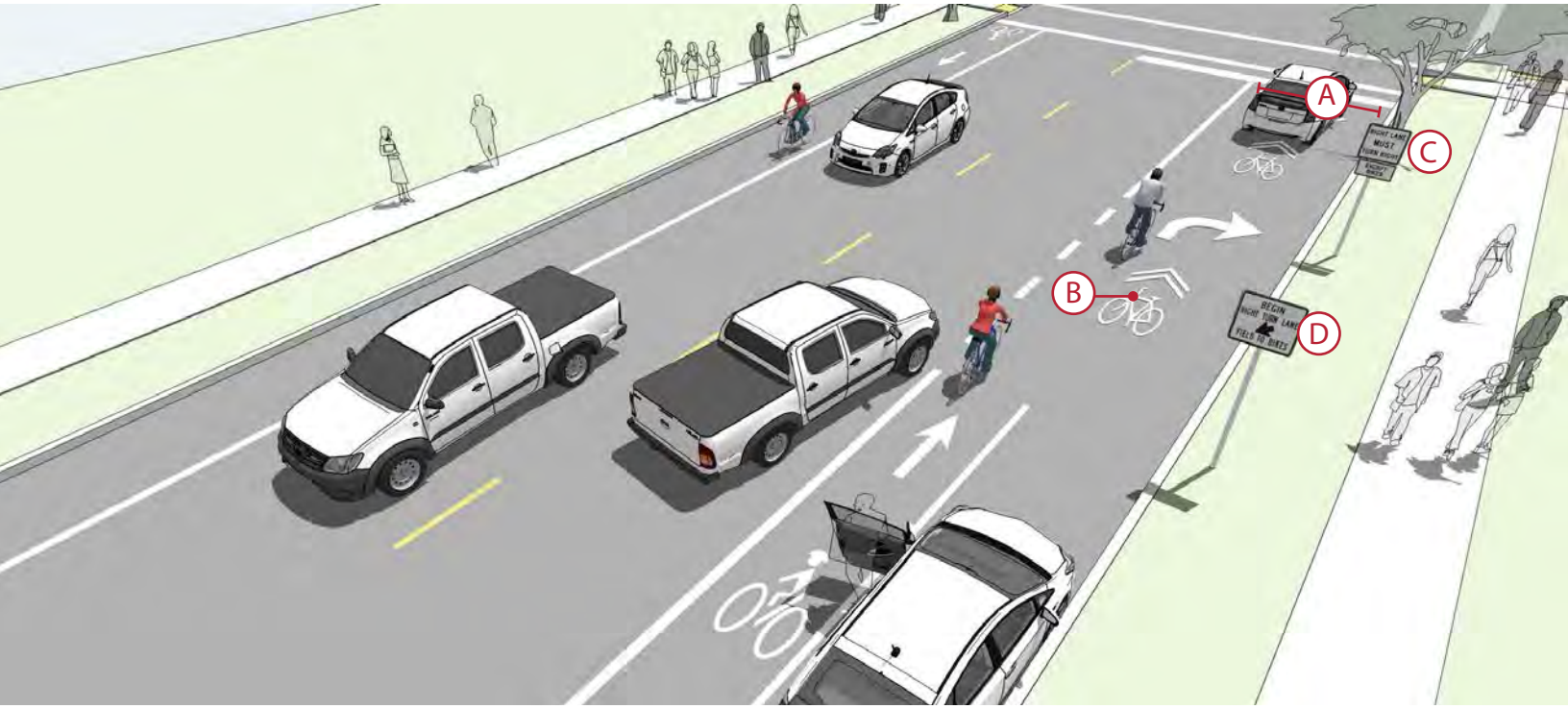
Design Features

- Typical white bike lanes (solid or dotted 6" stripe) are used to outline the green colored pavement.
- In exclusive use areas, color application should be solid green.
- In weaving or turning conflict areas, preferred striping is dashed, to match the bicycle lane line extensions.
- The colored surface should be skid resistant and retro-reflective.

INTERSECTION TREATMENTS

COMBINED BIKE LANE/TURN LANE

Where there isn't room for a conventional bicycle lane and turn lane a combined bike lane/turn lane creates a shared lane where bicyclists can ride and turning motor vehicles yield to through traveling bicyclists. The combined bicycle lane/ turn lane places shared lane markings within a right turn only lane.



Typical Application

- Most appropriate in areas with lower posted speeds (30 MPH or less) and with lower traffic volumes (10,000 ADT or less).
- May not be appropriate for high speed arterials or intersections with long right turn lanes.
- May not be appropriate for intersections with large percentages of right-turning heavy vehicles.

Design Features

(A) Maximum shared turn lane width is 13 feet; narrower is preferable. (NACTO, 2012)

(B) Shared Lane Markings should indicate preferred positioning of bicyclists within the combine lane.

(C) A "RIGHT LANE MUST TURN RIGHT" sign with an "EXCEPT BIKES" plaque may be needed to permit through bicyclists to use a right turn lane.

(D) Use R4-4 BEGIN RIGHT TURN LANE YIELD TO BIKES signage to indicate that motorists should yield to bicyclists through the conflict area.

INTERSECTION TREATMENTS

INTERSECTION CROSSING MARKINGS

Bicycle pavement markings through intersections guide bicyclists on a safe and direct path through the intersection and provide a clear boundary between the paths of through bicyclists and vehicles in the adjacent lane.

Typical Application

- Streets with conventional, buffered or separated bike lanes.
- At direct paths through intersections.
- Streets with high volumes of adjacent traffic.
- Where potential conflicts exist between through bicyclist and adjacent traffic.

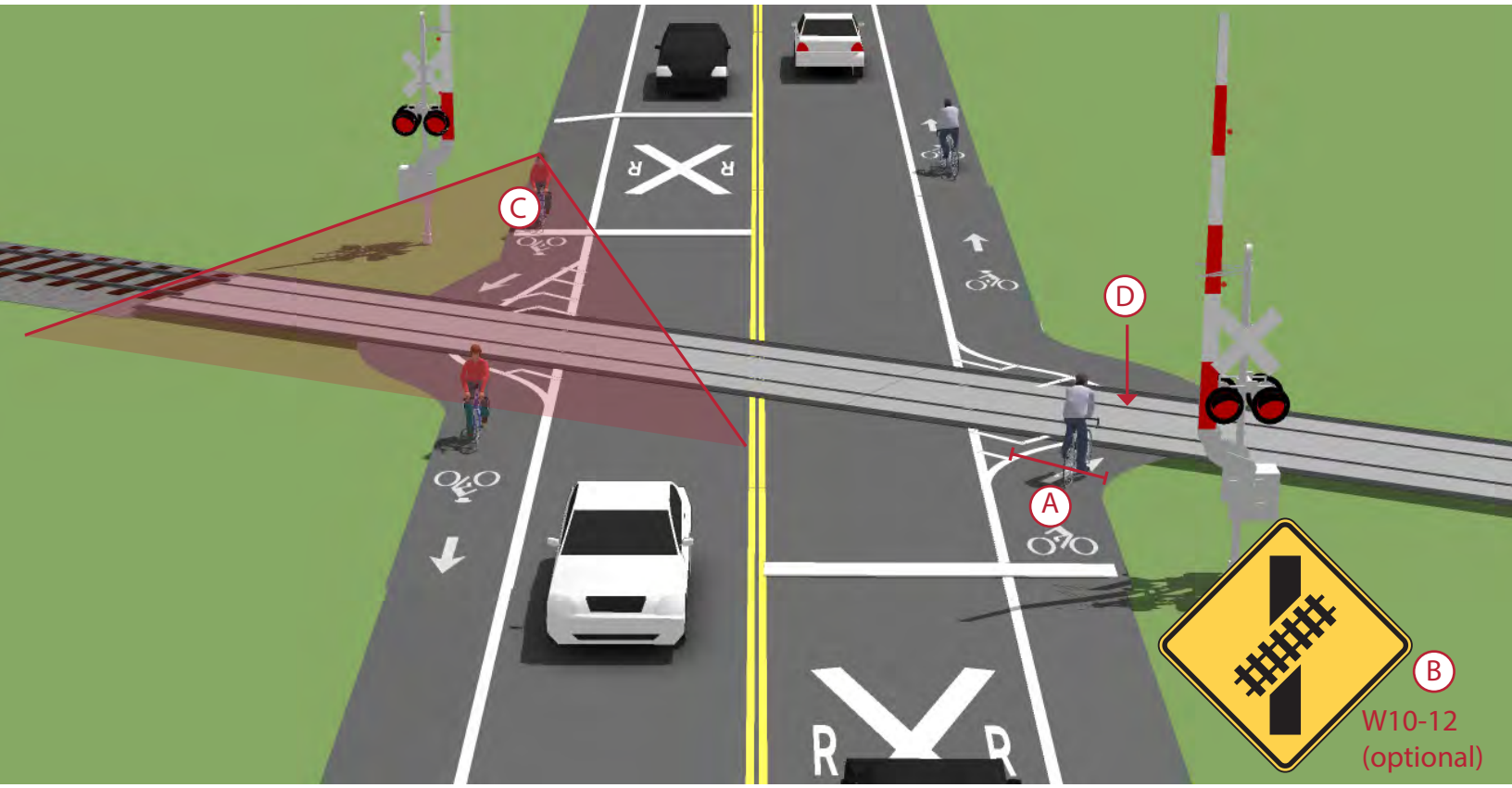
Design Features

- Intersection markings should be the same width and in line with leading bike lane.
- (A) Dotted lines should be a minimum of 6 inches wide and 4 feet long, spaced every 12 feet.
- All markings should be white, skid resistant and retro reflective.
- (B) Green pavement markings may also be used.

INTERSECTION TREATMENTS

AT-GRADE RAILROAD CROSSING

Bikeways that cross railroad tracks at a diagonal may cause steering difficulties or loss of control for bicyclists due to slippery surfaces, degraded rough materials, and the size of the flangeway gaps.



Typical Application

- Where bikle lanes, shoulders or physically separated bike lanes cross railroad tracks.
- Provide extra design attention to angled track crossings.
- Crossing design and implementation is a collaboration between the railroad company and highway agency. The railroad company is responsible for the crossbucks, flashing lights and gate mechanisms, and the highway agency is responsible for advance warning markings and signs.

Design Features

(A) 6 ft minimum shoulder/bike lane width.

(B) Consider posting W-10 or W-12 signs to alert bicyclists.

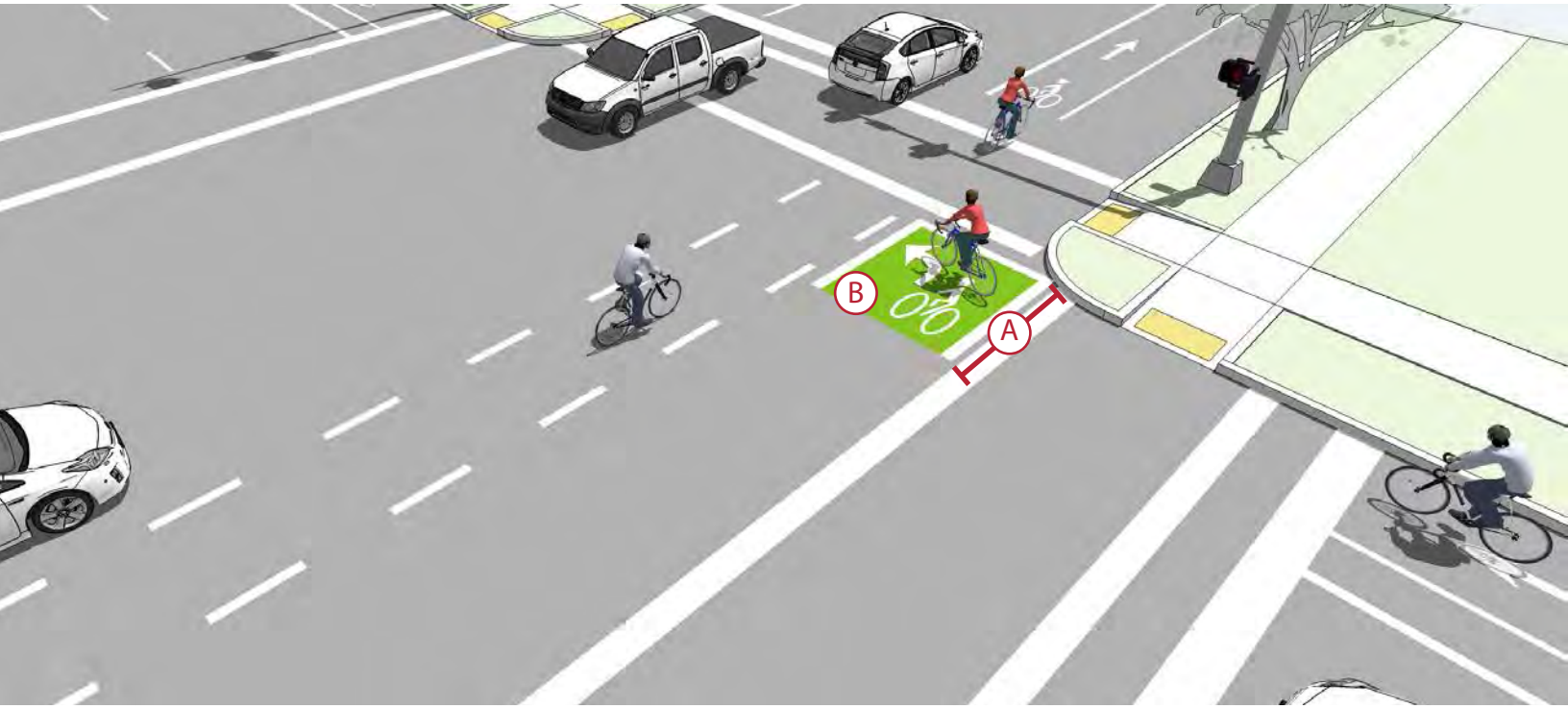
(C) Sight triangles of 50 feet by 100 feet will be provided at the railroad and street right of way. (Sight triangles are measured from the centerline of the railroad track.

(D) Angled track crossings also limit sight triangles, impacting the ability to see oncoming trains. If the skew angle is less than 45 degrees, special attention should be given to the sidewalk and bicycle alignment to improve the approach angle to at least 60 degrees (90 degrees preferred where possible).

INTERSECTION TREATMENTS

TWO-STAGE TURN BOXES

Two- stage turn boxes offer bicyclists a safe way to make turns at multi-lane signalized intersections from a physically separated or conventional bike lane. On cycle tracks, bicyclists are often unable to merge into traffic to turn due to physical separation, making the provision of two-stage turn boxes critical.



Typical Application

- Streets with high vehicle speeds and/or traffic volumes.
- At intersections with multi-lane roads with signalized intersections.
- At signalized intersections with a high number of bicyclists making a left turn from a right side facility.

Design Features

- The two-stage turn box shall be placed in a protected area. Typically this is within the shadow of an on-street parking lane or protected bike lane buffer area and should be placed in front of the crosswalk to avoid conflict with pedestrians.

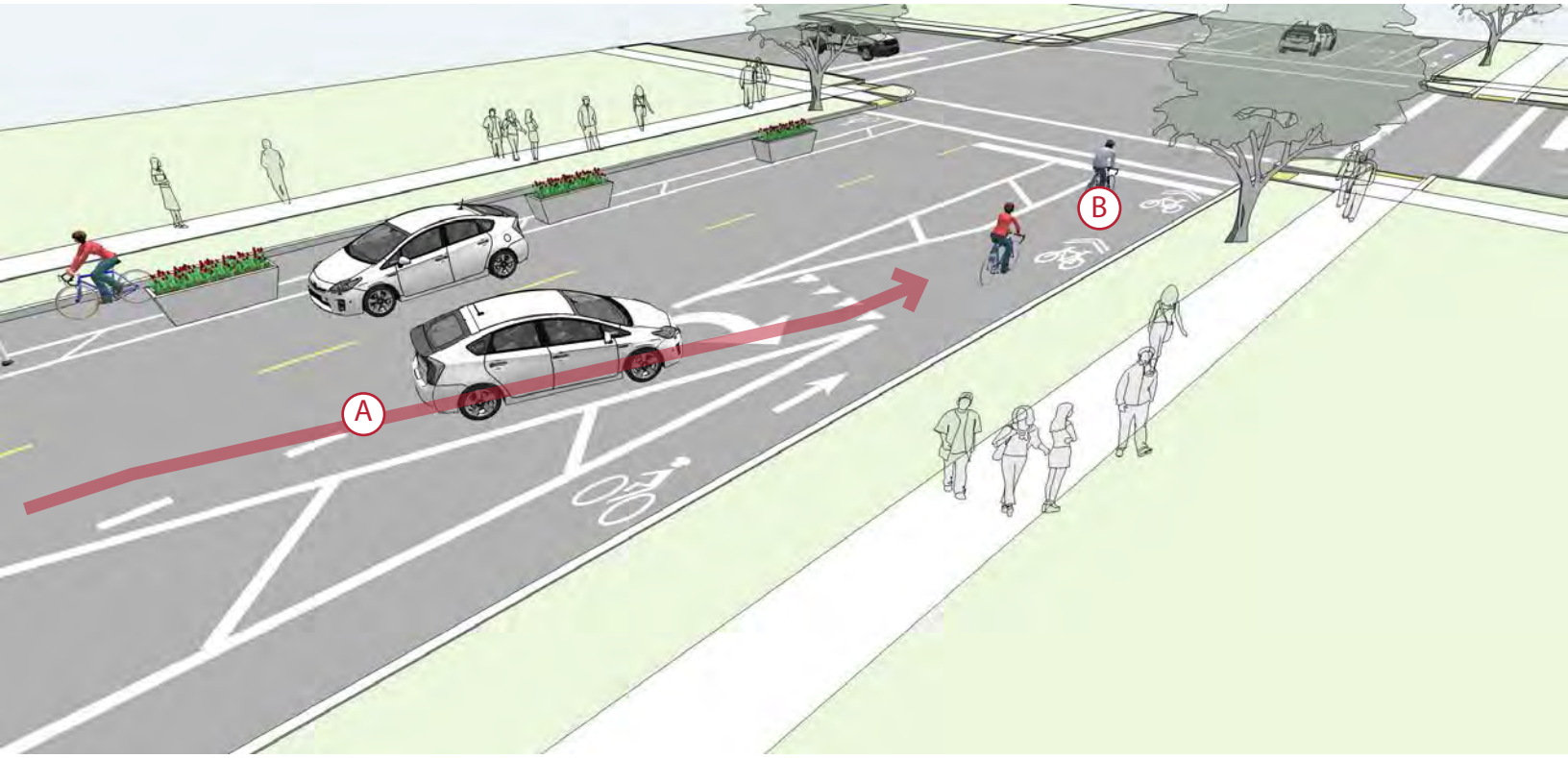
(A) 8 foot x 6 foot preferred depth of bicycle storage area (6 foot x 3 foot minimum).

(B) Bicycle stencil and turn arrow pavement markings shall be used to indicate proper bicycle direction and positioning. **(NACTO, 2012)**

INTERSECTION TREATMENTS

SEPARATED BIKE LANE MIXING ZONE

A separated bike lane mixing zone creates a shared-space travel lane where turning motor vehicles yield to through traveling bicyclists. Geometric design is intended to slow motor vehicles to bicycle speed, provide regulatory guidance to people driving, and require all users to negotiate conflicts upstream of the intersection.



Typical Application

- Where through bcicylists and right-turning automobile conflicts are common.
- Most appropriate in areas with low to moderate right-turn volumes.
- Streets with a right turn lane but not enough width to have a standard width bicycle lane at the intersection.

Design Features

(A) Use short transition taper dimensions and short storage length to promote slow motor vehicle travel speeds.

(B) The width of the mixing zone should be 9 feet minimum and 13 feet maximum.

- The transition to the mixing zone should begin 70 feet in advance of the intersection.
- Shared lane markings should be used to illustrate the bicyclist's position within the lane.
- A yield line should be used in advance of the intersection.

INTERSECTION TREATMENTS

BICYCLE SIGNAL HEAD & PROTECTED SIGNAL PHASE

Protected bicycle lane crossings of signalized intersections can be accomplished through the use of a bicycle signal phase which reduces conflicts with motor vehicles by separating bicycle movements from any conflicting motor vehicle movements. Bicycle signals are traditional three lens signal heads with green, yellow and red bicycle stenciled lenses.

Typical Application

- Two-way protected bike lanes where contraflow bicycle movement or increased conflict points warrant protected operation.
- Bicyclists moving on a green or yellow signal indication in a bicycle signal shall not be in conflict with any simultaneous motor vehicle movement at the signalized location
- Right (or left) turns on red should be prohibited in locations where such operation would conflict with a green bicycle signal indication.

Design Features

- An additional "Bicycle Signal" sign should be installed below the bicycle signal head.
- Designs for bicycles at signalized crossings should allow bicyclists to trigger signals and safely maneuver the crossing.
- On bikeways, signal timing and actuation shall be reviewed and adjusted to consider the needs of bicyclists.

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BICYCLE SIGNING & WAYFINDING

The ability to navigate through a city is informed by landmarks, natural features and other visual cues. Bicycle wayfinding can assist in navigation to guide bicyclists to their destinations along preferred bicycle routes. Signs are typically placed at decision points along bicycle routes – typically at the intersection of two or more bikeways and at other key locations leading to and along bicycle routes.

BICYCLE SIGNING & WAYFINDING

WAYFINDING SIGN TYPES

The ability to navigate through a city is informed by landmarks, natural features and other visual cues. Signs throughout the city should indicate to bicyclists the direction of travel, the locations of destinations and the travel time/distance to those destinations. A bicycle wayfinding system consists of comprehensive signing and/or pavement markings to guide bicyclists to their destinations along preferred bicycle routes.

D11-1c

D1-1

D11-1/D1-3a

Typical Application

- Wayfinding signs will increase users' comfort and accessibility to the bicycle systems.
- Signage can serve both wayfinding and safety purposes including:
  - Helping to familiarize users with the bicycle network
  - Helping users identify the best routes to destinations
  - Helping to address misperceptions about time and distance
  - Helping overcome a "barrier to entry" for people who are not frequent bicyclists (e.g., "interested but concerned" bicyclists)

Design Features

(A) Confirmation signs indicate to bicyclists that they are on a designated bikeway. Make motorists aware of the bicycle route. Can include destinations and distance/time but do not include arrows.

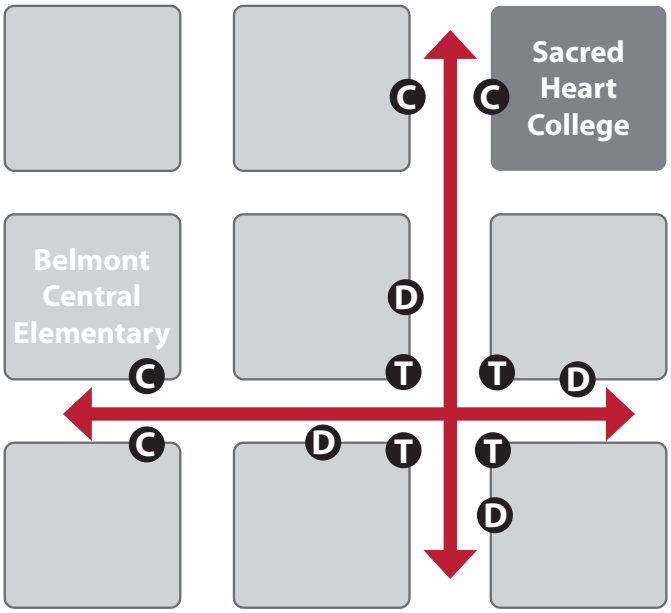
(B) Turn signs indicate where a bikeway turns from one street onto another street. These can be used with pavement markings and include destinations and arrows.

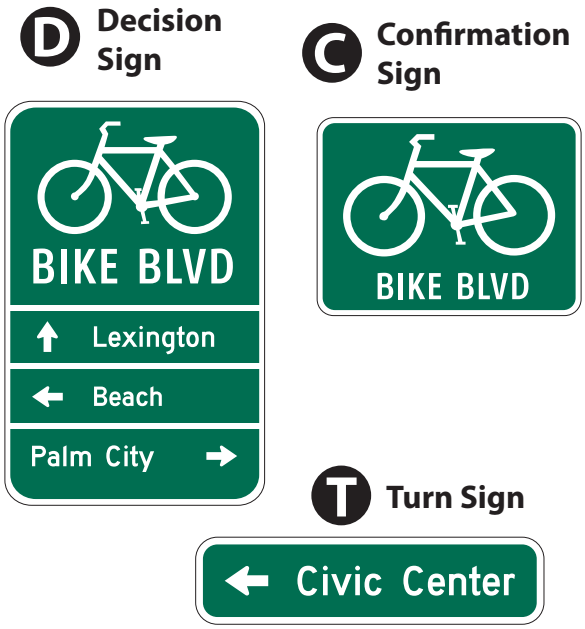
(C) Decisions signs indicate the junction of two or more bikeways and inform bicyclists of the designated bike route to access key destinations. These include destinations, arrows and distances. Travel times are optional but recommended.

BICYCLE SIGNING & WAYFINDING

WAYFINDING SIGN PLACEMENT

Signs are placed at decision points along bicycle routes – typically at the intersection of two or more bikeways and at other key locations leading to and along bicycle routes.





Typical Application

Confirmation Signs

- Placed every ¼ to ½ mile on off-street facilities and every 2 to 3 blocks along on-street bicycle facilities, unless another type of sign is used (e.g., within 150 ft of a turn or decision sign).
- Should be placed soon after turns to confirm destination(s). Pavement markings can also act as confirmation that a bicyclist is on a preferred route.

Turn Signs

- Near-side of intersections where bike routes turn (e.g., where the street ceases to be a bicycle route or does not go through).
- Pavement markings can also indicate the need to turn to the bicyclist.

Decision Signs

- Near-side of intersections in advance of a junction with another bicycle route.
- Along a route to indicate a nearby destination.

Design Features

- MUTCD guidelines should be followed for wayfinding sign placement, which includes mounting height and lateral placement from edge of path or roadway.
- Pavement markings can be used to reinforce routes and directional signage.

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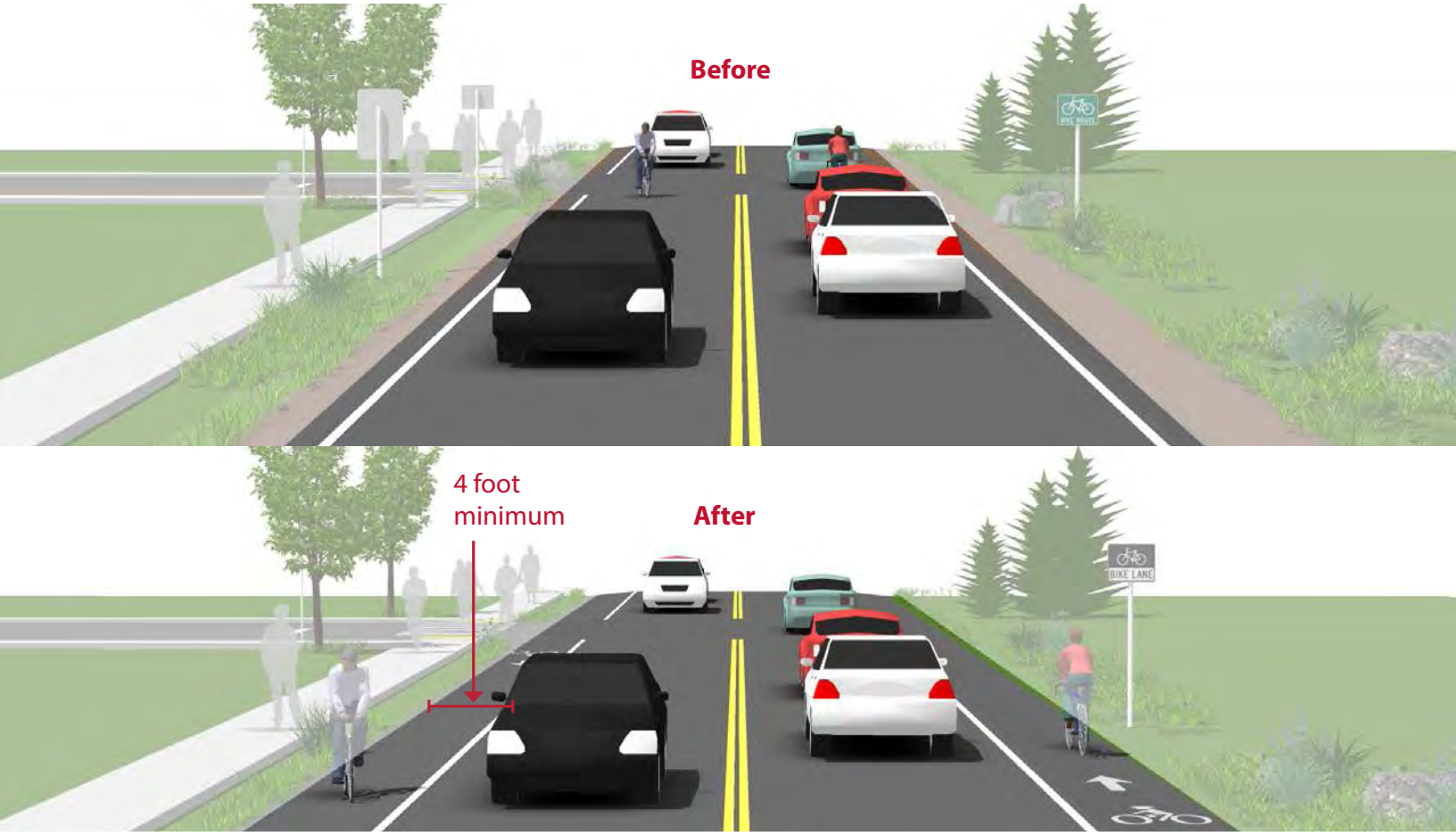
RETROFITTING STREETS

RETROFITTING STREETS

ROADWAY WIDENING

Bike lanes can be accommodated on streets with excess right-of-way through shoulder widening. Although roadway widening incurs higher expenses compared with re-striping projects, bike lanes can be added to streets currently lacking curbs, gutters and sidewalks without the high costs of major infrastructure reconstruction.



Typical Application

- On existing streets that lack bicycle infrastructure.
- Roadway widening is most appropriate on roads lacking curbs, gutters and sidewalks.

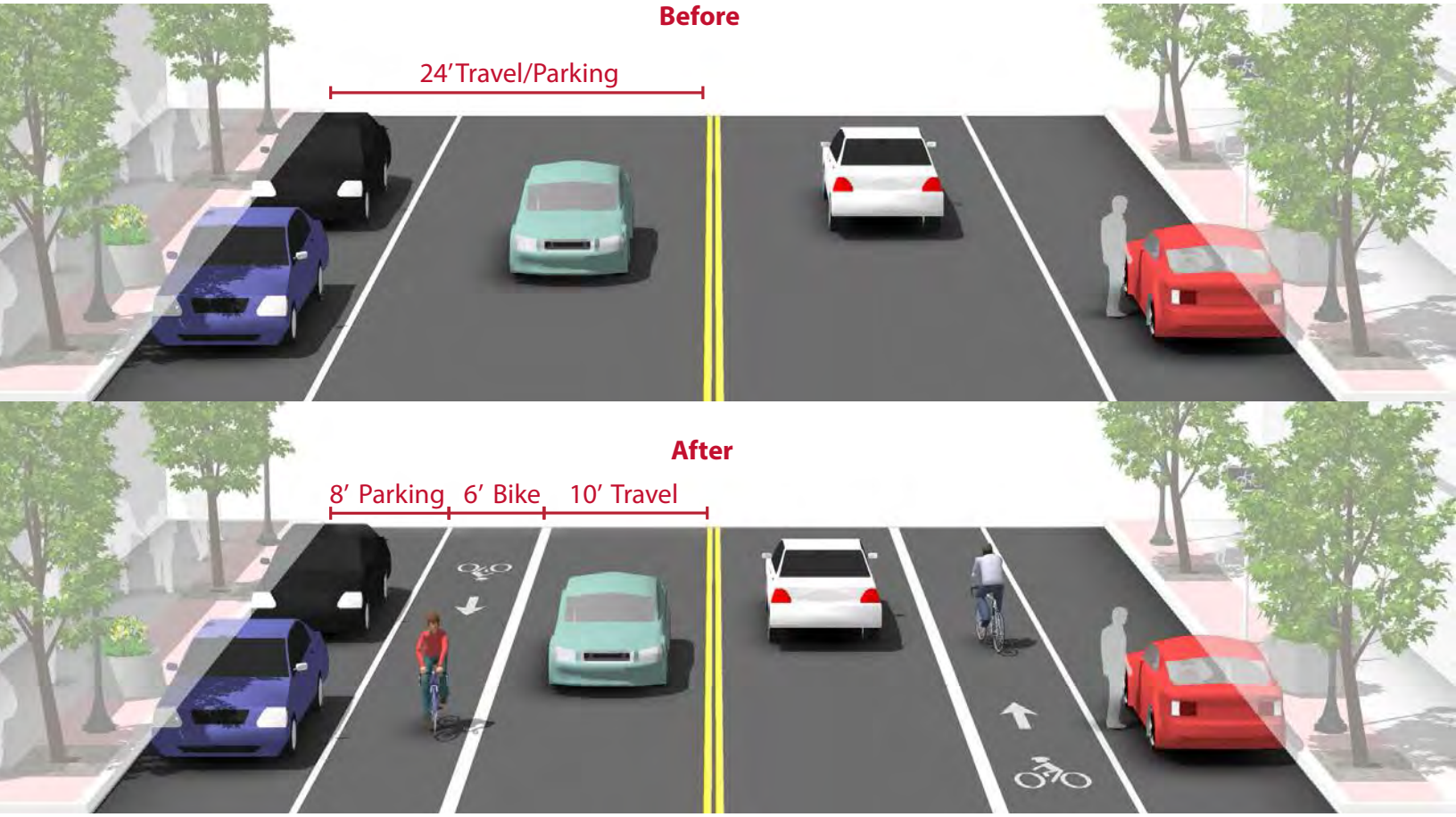
Design Features

- Guidance on bicycle lanes applies to this treatment.
- 4 foot minimum width bike lane when no curb and gutter is present.
- 6 foot width bike lane is preferred.

RETROFITTING STREETS

LANE NARROWING

Lane narrowing utilizes roadway space that exceeds minimum standards to provide the needed space for bike lanes. Many roadways have existing travel lanes that are wider than those prescribed in local and national roadway design standards, or which are not marked. Most standards allow for the use of 11 foot and sometimes 10 foot wide travel lanes to create space for bike lanes.



Typical Application

- On existing streets with wide travel lanes (11-15 feet) that lack bicycle infrastructure.

Design Features

Vehicle lane width:

- Before: 11-15 feet
- After: 10-11 feet

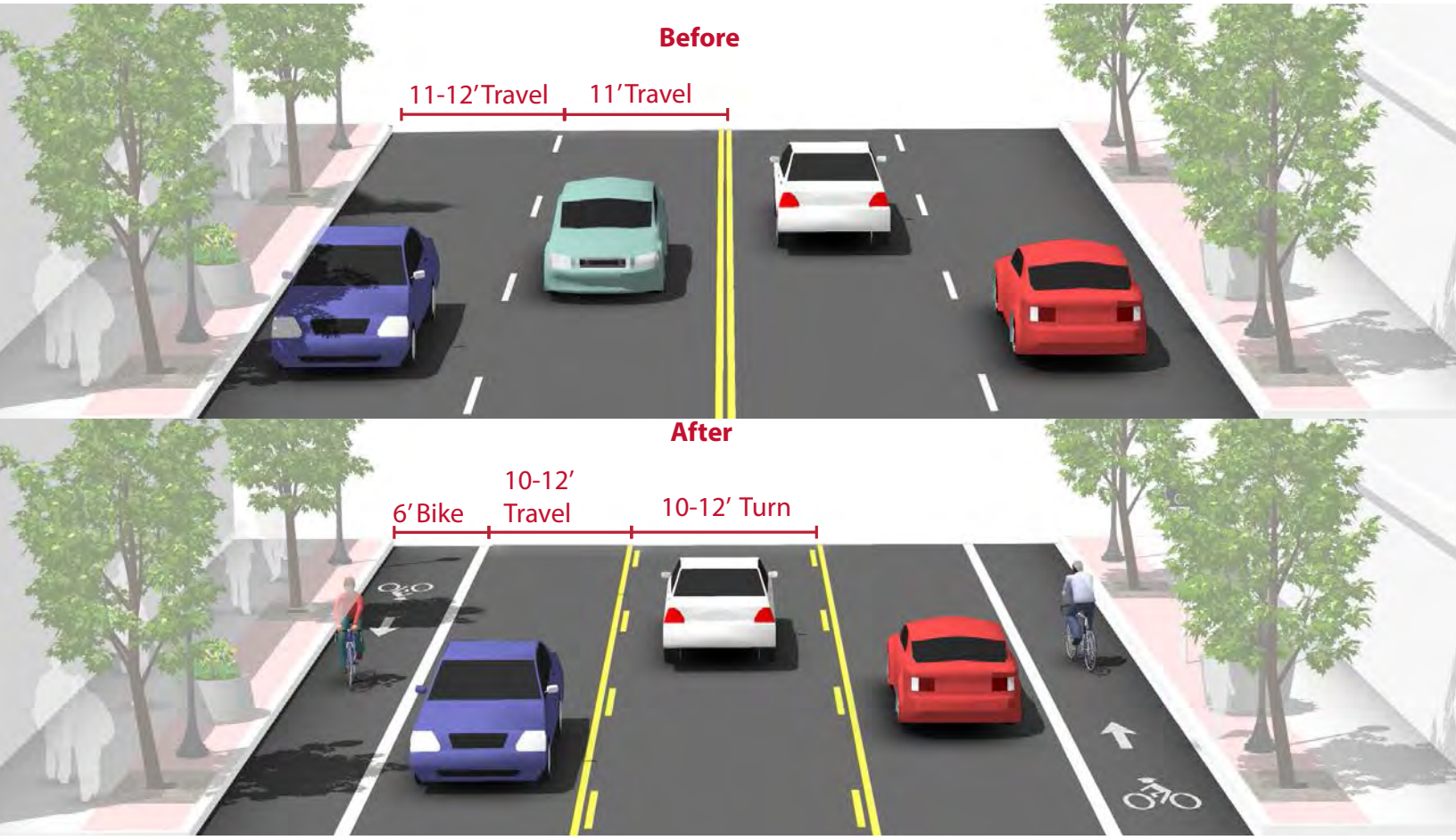
Bicycle lane width:

- 6 feet wide preferred (5 foot minimum)

RETROFITTING STREETS

LANE RECONFIGURATION

The removal of a single travel lane will generally provide sufficient space for bike lanes on both sides of a street. Streets with excess vehicle capacity provide opportunities for bicycle lane retrofit projects.



Typical Application

- On existing streets operating below current built capacity that lack bicycle infrastructure.
- One common conversion is from a four lane undivided streets to a three lane street including a center turn lane.

Design Features

Vehicle lane width:

- Width depends on project. No narrowing may be needed if a travel lane is removed.

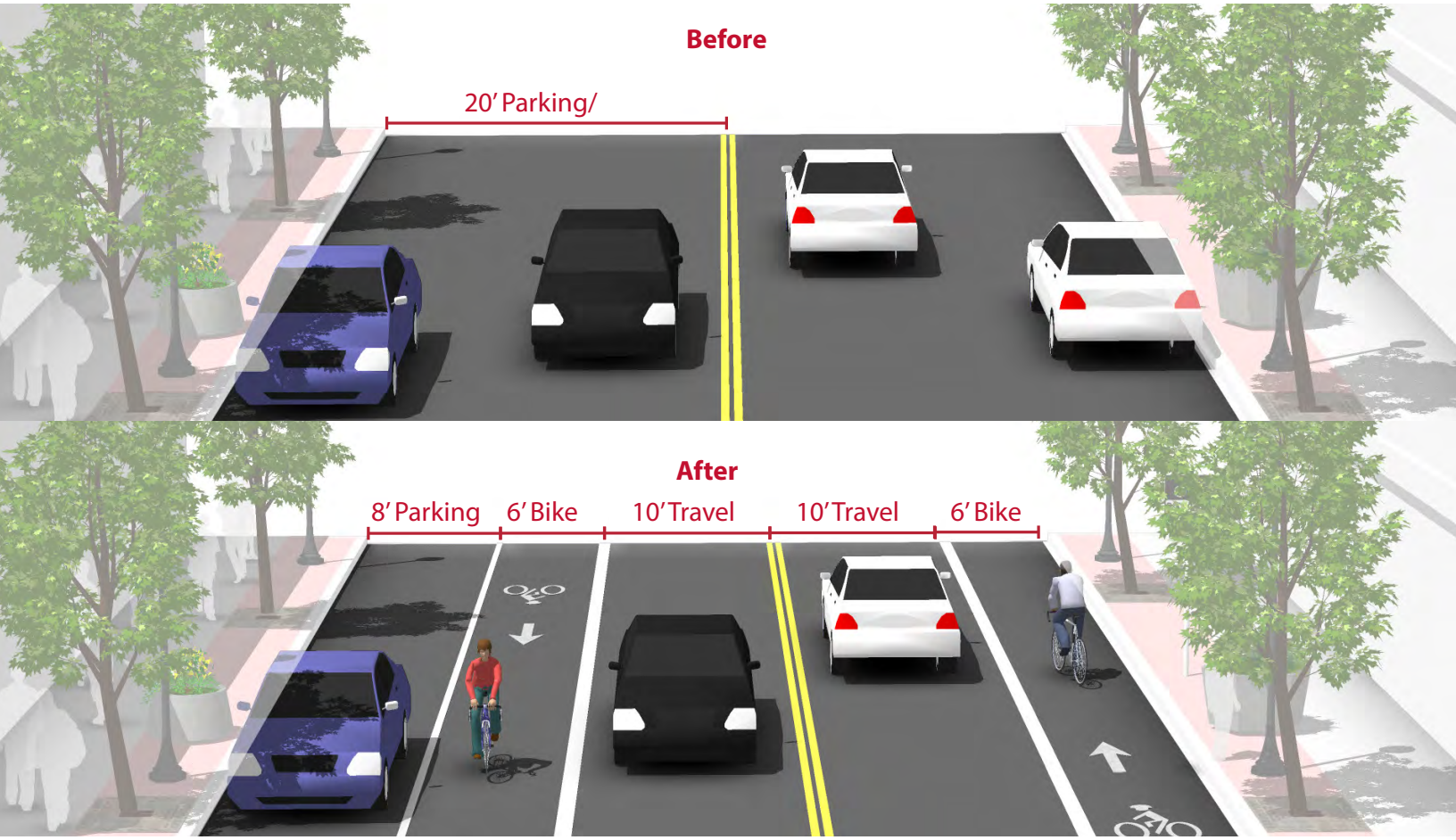
Bicycle lane width:

- Guidance on bicycle lanes applies to this treatment.

RETROFITTING STREETS

PARKING REDUCTION

Bike lanes can replace one or more on-street parking lanes on streets where excess parking exists and/or the importance of bike lanes outweighs parking needs. For example, parking may be needed on only one side of a street. Eliminating or reducing on-street parking also improves sight distance for bicyclists in bike lanes and for motorists on approaching side streets and driveways.



Typical Application

- On existing streets with underutilized parking (< 50% occupancy)

Design Features

Vehicle lane width:

- Parking lane width depends on project. No travel lane narrowing may be required depending on the width of the parking lanes.

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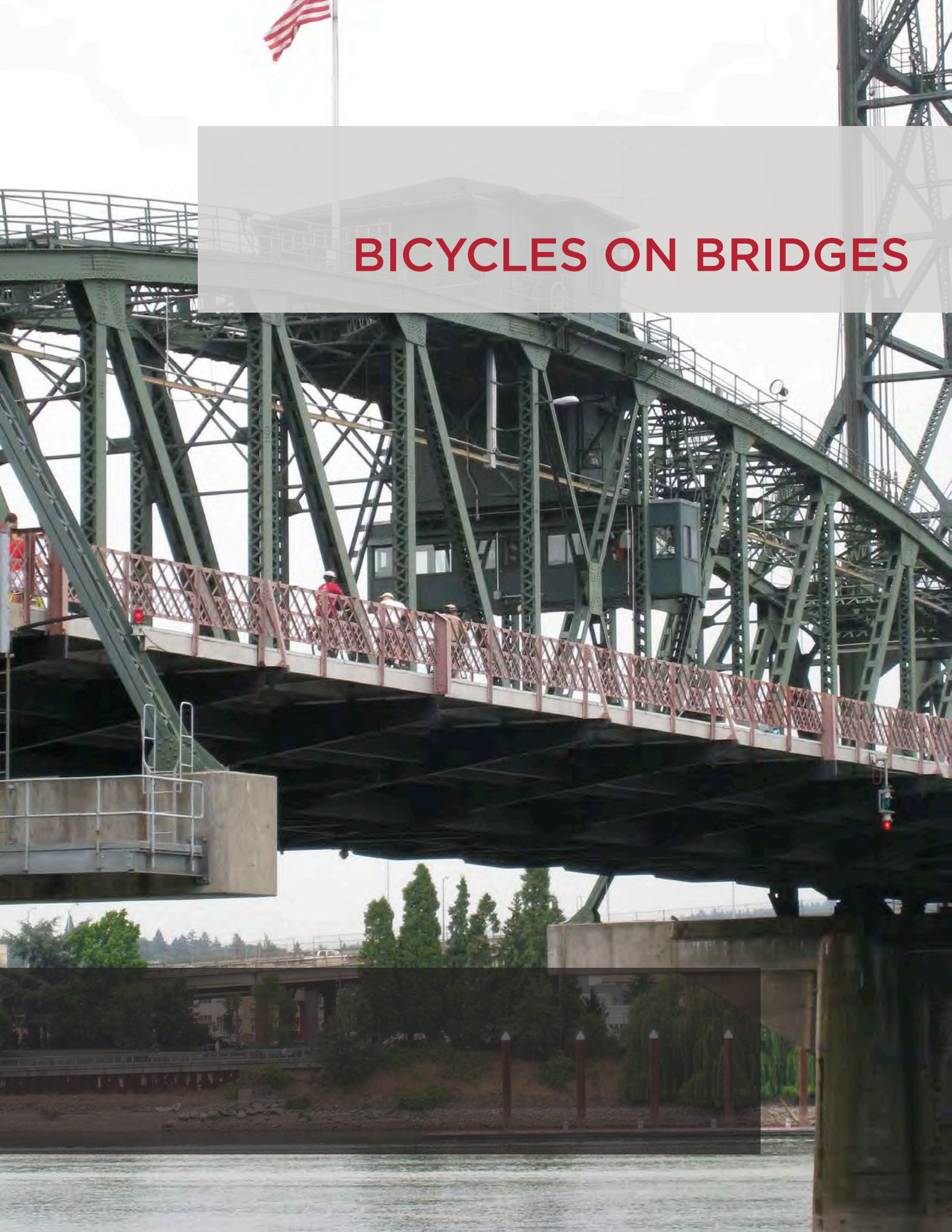
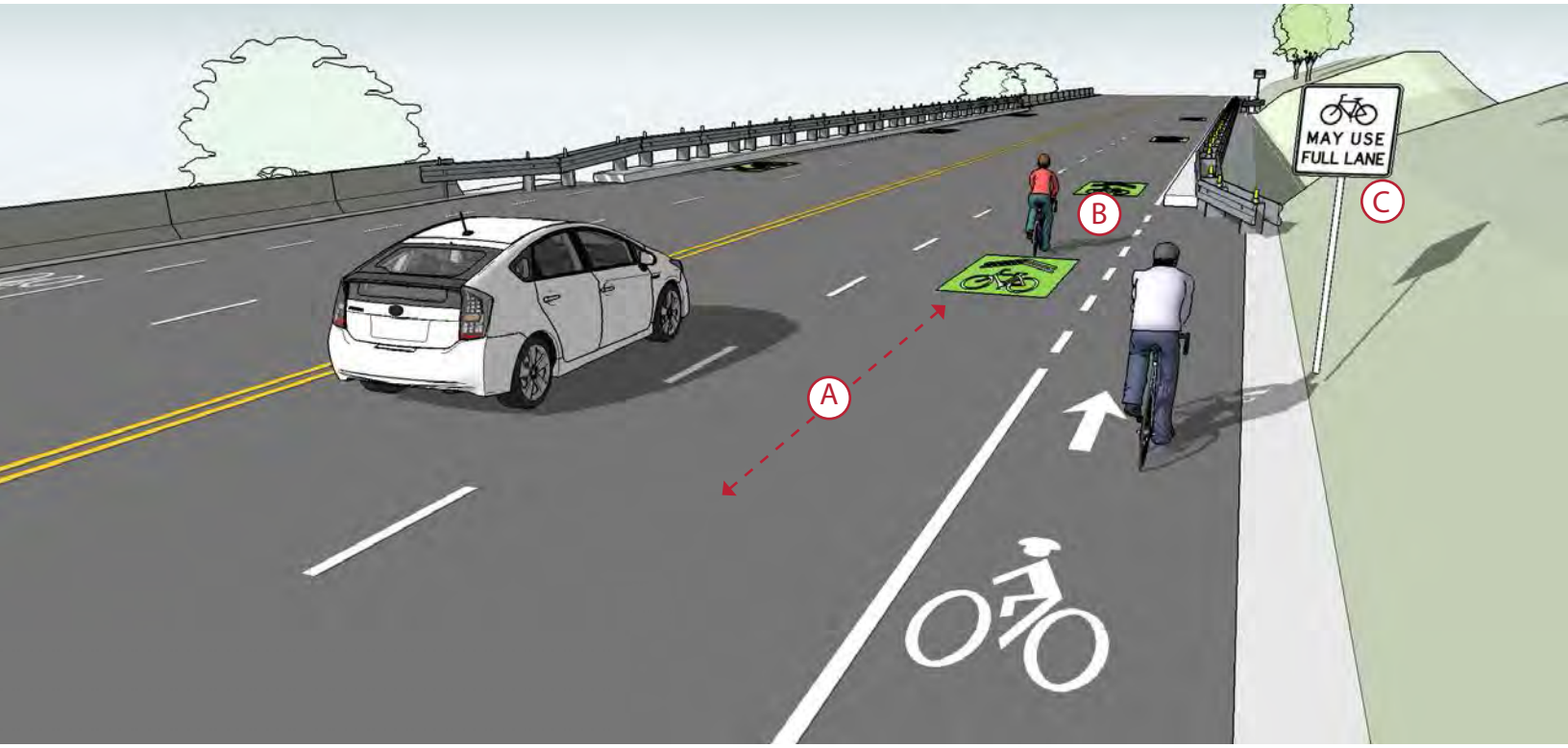
BICYCLES ON BRIDGES



BICYCLES ON BRIDGES

SHARED LANES ON BRIDGES

Constrained spaces such as bridges may require shared lane operation of bicyclists and cars for a short distance. Enhanced marking and signage can alert all road users to this changed condition.



Typical Application

- On existing bridges lacking space for dedicated bicycle facilities.

Design Features

(A) Shared lane markings should be placed in the center of the travel lane. If the outside lane is 14 ft wide, the center of the shared lane marking may be placed 4 ft from the curb line.

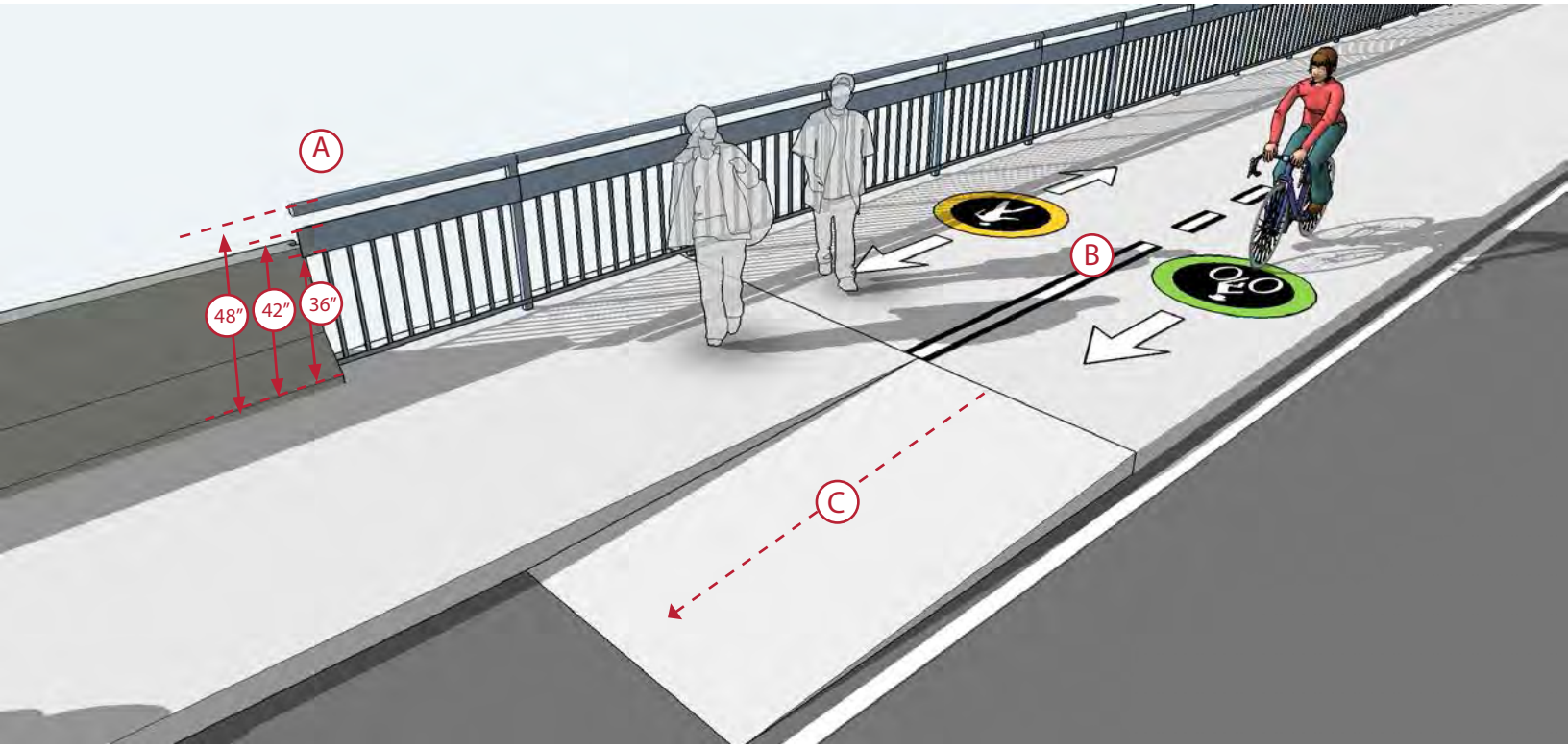
(B) Some jurisdictions are experimenting with green colored pavement to enhance the shared lane marking. (requires FHWA experimentation approval)

(C) Bikes May Use Full Lane sign (R4-11) should be used to remind users of the bicyclists right to occupy a travel lane.

BICYCLES ON BRIDGES

PATHS ON BRIDGES

Paths attached to bridges should provide adequate width for intended user type and travel direction and should use bicycle compatible railings.



Typical Application

- Paths retrofit on the side of bridges
- Wide bridge sidewalks functioning as shared use paths

Design Features

(A) Bicycle compatible "Rub Rail" design should be used to prevent snags with bicycle handlebars.

(B) User stencils and striping may be used to clarify user mode and direction.

(C) Transition ramps off of the bridge path should be gradual.

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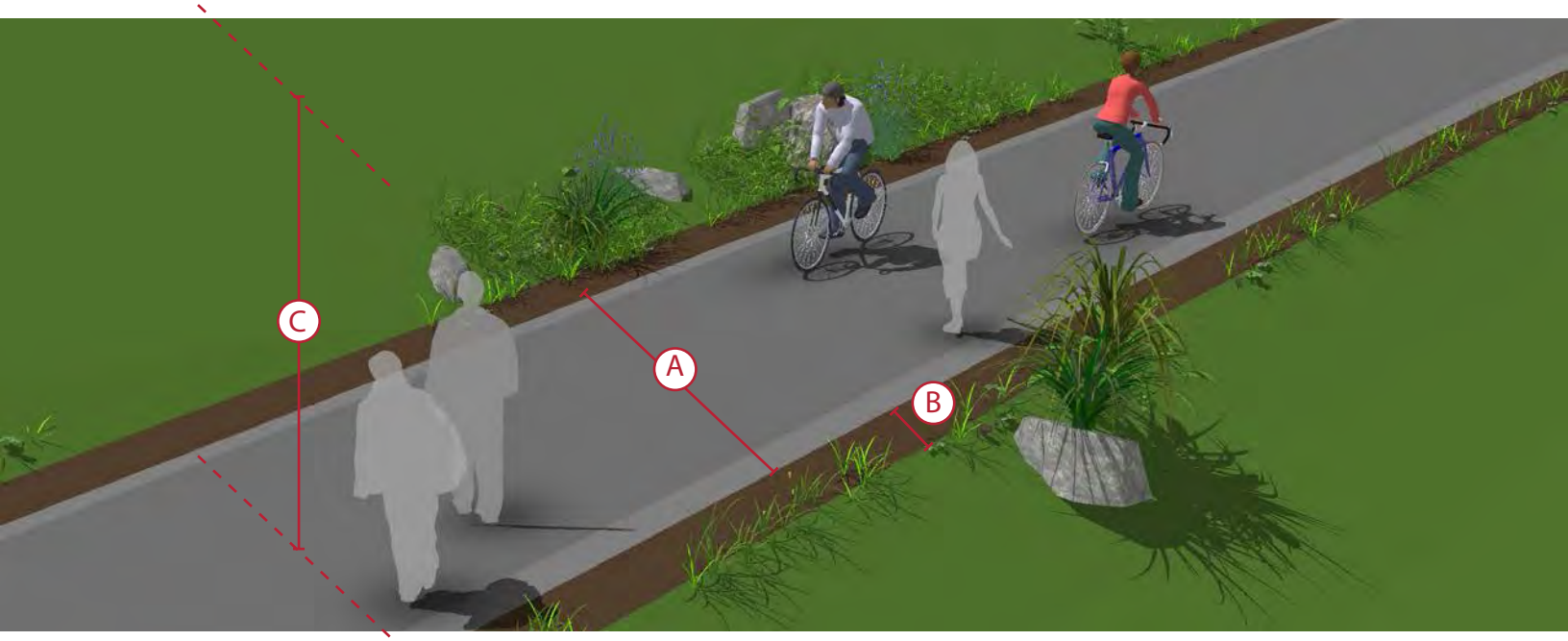
SHARED USE PATHS

SHARED USE PATHS

SHARED USE PATHS

A shared use path allows for two-way, off-street bicycle use and also may be used by pedestrians, skaters, wheelchair users, joggers and other non-motorized users. Shared use paths can provide a desirable facility, particularly for recreation, and users of all skill levels preferring separation from traffic. Bicycle paths should generally provide directional travel opportunities not provided by existing roadways.



Design Features

Width

(A) 10 feet is recommended in most situations and will be adequate for low to moderate use. (8 ft constrained minimum)

- 12 feet is recommended for heavy use situations with high concentrations of multiple users. If additional width is available a separate track (5' minimum) can be provided for pedestrian use.

Lateral Clearance

(B) A 2 foot or greater shoulder on both sides of the path should be provided. An additional foot of lateral clearance (total of 3') is required by the MUTCD for the installation of signage or other furnishings.

- If bollards are used at intersections and access points, they should be colored brightly and/or supplemented with reflective materials to be visible at night.

Overhead Clearance

(C) Clearance to overhead obstructions should be 10 feett (8 feet minimum

Striping

- When striping is required, use a 4 inch dashed yellow centerline stripe with 4 inch solid white edge lines.

SHARED USE PATHS

SHARED USE PATHS IN RIVER & UTILITY CORRIDORS

Utility and waterway corridors often offer excellent shared use path development and bikeway gap closure opportunities. These corridors offer excellent transportation and recreation opportunities for bicyclists of all ages and skills.

Typical Application

- Along utility and river corridors where public access is desired.
- Utility corridors typically include power line and sewer corridors, while waterway corridors include canals, drainage ditches, rivers, and beaches.

Design Features

Access Points

- Any access point to the path should be well-defined with appropriate signage designating the pathway as a bicycle facility and prohibiting motor vehicles.

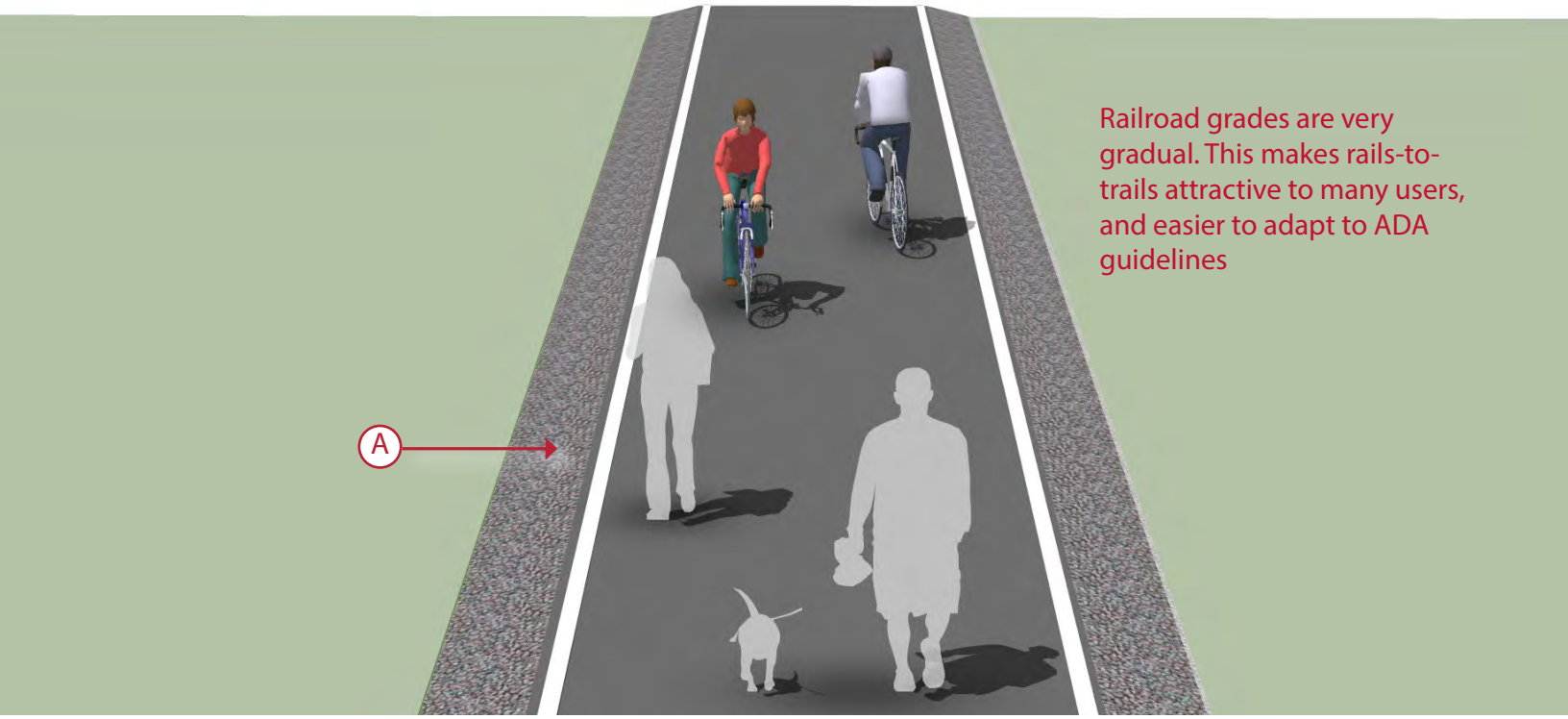
Path Closure

- Public access to the shared use path may be prohibited during the following events:
- Canal/flood control channel or other utility maintenance activities
- Inclement weather or the prediction of storm conditions.

SHARED USE PATHS

SHARED USE PATHS IN ABANDONED RAIL CORRIDORS

Commonly referred to as Rails-to-Trails or Rail-Trails, these projects convert vacated rail corridors into off-street paths. Rail corridors offer several advantages, including relatively direct routes between major destinations and generally flat terrain.



Typical Application

- Along abandoned railroad corridors where public access is desired.
- In some cases, rail owners may rail-bank their corridors as an alternative to a complete abandonment of the line, thus preserving the rail corridor for possible future use.

Design Features

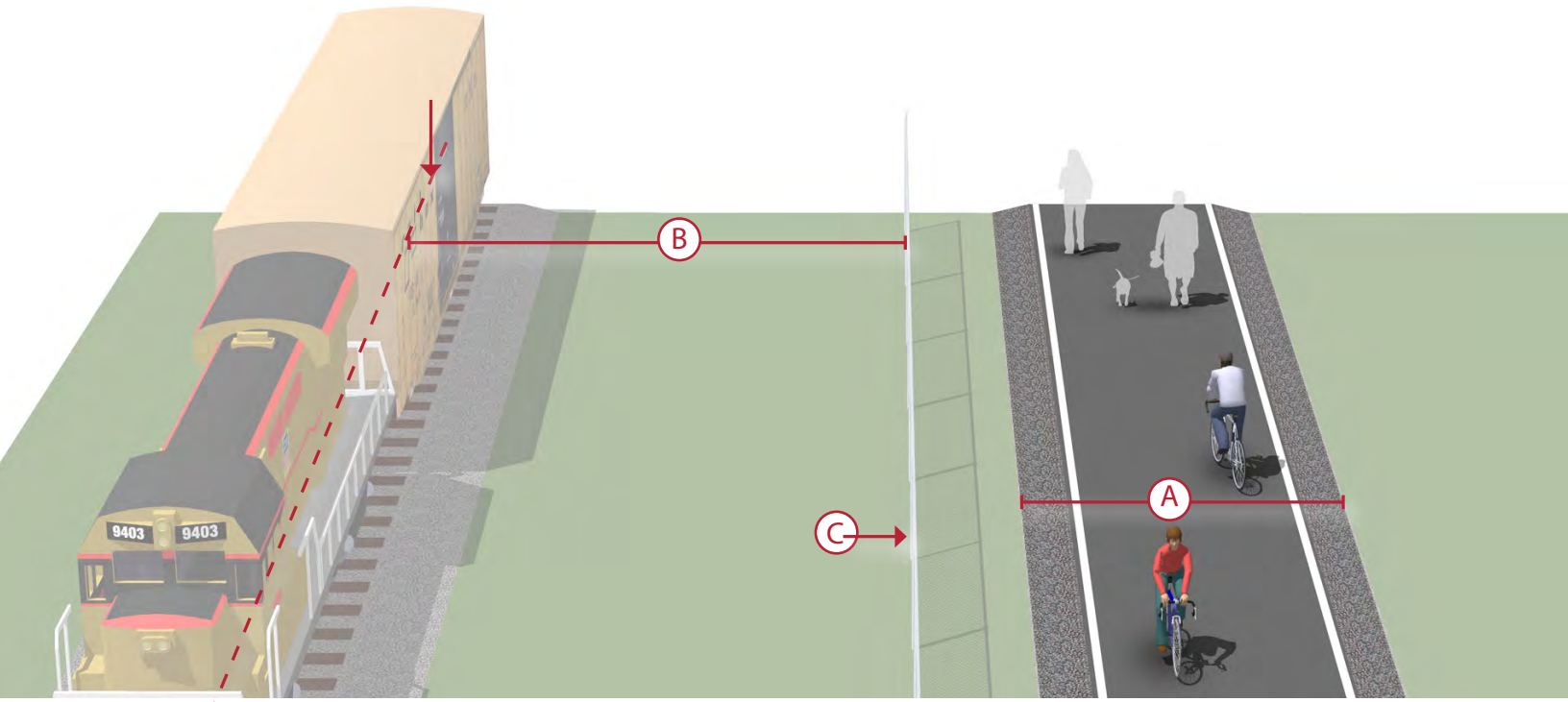
- In full conversions of abandoned rail corridors, the sub-base, superstructure, drainage, bridges, and crossings are already established. Design becomes a matter of working with the existing infrastructure to meet the needs of a rail-trail.

(A) Where possible, leave as much of the ballast in place as possible to disperse the weight of the rail-trail surface and to promote drainage

SHARED USE PATHS

SHARED USE PATHS IN ACTIVE RAIL CORRIDORS

Commonly referred to as Rails-with-Trails or Rail-Trails, these projects typically consist of paths adjacent to active railroads.



Typical Application

- Along active railroad corridors where public access is desired.
- In some cases, space needs to be preserved for future planned freight, transit or commuter rail service

Design Features

(A) Shared use paths in utility corridors should meet or exceed general design standards. If additional width allows, wider paths, and landscaping are desirable.

(B) Setback is based on space constraints, train frequency, train speed and physical separation, with 10-25 ft minimum from centerline of tracks.

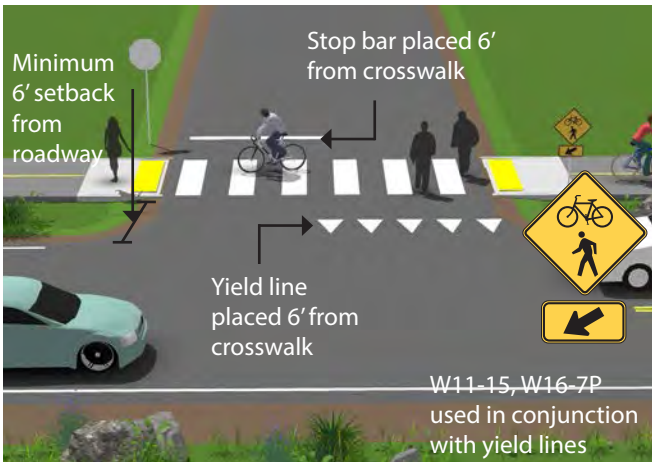
(C) If required, fencing should be a minimum of 5 feet in height with higher fencing than usual next to sensitive areas such as switching yards.

SHARED USE PATHS

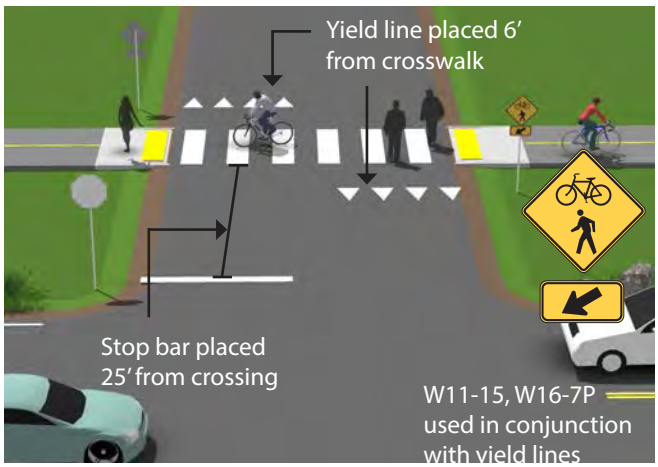
SHARED USE PATH ALONG ROADWAYS

Shared use paths along roadways, also called sidepaths, are a type of path that run adjacent to a street.

Ⓐ ***Adjacent Path Crossing***



Ⓑ ***Setback Path Crossing***



Typical Application

- Where off-street bicycle and pedestrian facilities are desired.
- Because of operational concerns it is generally preferable to place paths within independent rights-of-way away from roadways. However, there are situations where existing roads provide the only corridors available

Design Features

In general, there are two approaches to crossings:

Ⓐ ADJACENT PATH CROSSING

- A separation of 6 feet emphasizes the conspicuity of riders at the approach to the crossing.

Ⓑ SETBACK PATH CROSSING

- A set back of 25 feet separates the path crossing from merging/turning movements that may be competing for a driver's attention.
- Crossing design should emphasize visibility of users and clarity of expected yielding behavior. Crossings may be STOP or YIELD controlled depending on sight lines and bicycle motor vehicle volumes and speeds.

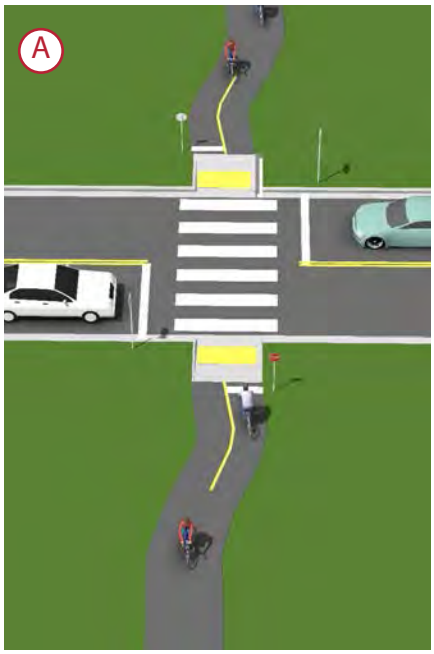
SHARED USE PATH CROSSINGS

SHARED USE PATH CROSSINGS

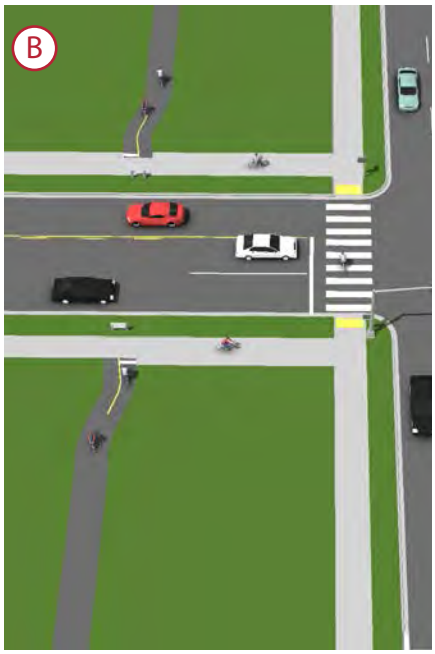
STREET CROSSINGS

The approach to designing path crossings of streets depends on an evaluation of vehicular traffic, line of sight, pathway traffic, use patterns, vehicle speed, road type, road width, and other safety issues such as proximity to major attractions.

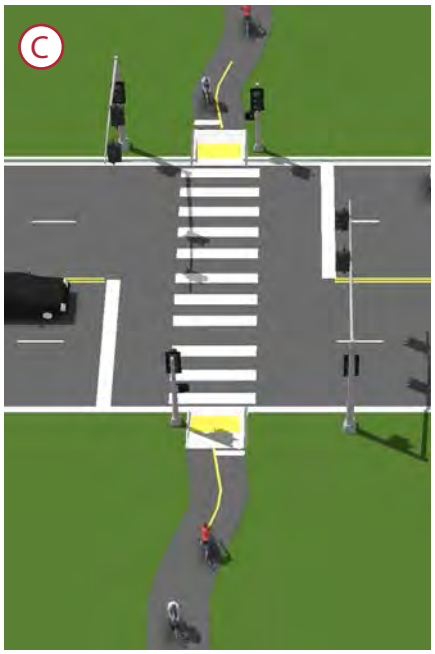
Marked Uncontrolled Crossing



Route Users to Signal



Signal Control



Typical Application

(A) MARKED CROSSINGS

- Appropriate on a two lane road with ≤9,000-12,000 Average Daily Traffic (ADT) volume, and ≤ 35 mph speed.
- Crossings of streets with higher speeds, higher volumes, and additional lanes requires additional enhancements such as median islands or active warning beacons.

(B) ROUTE USERS TO SIGNAL

- Path crossings should not be provided within approximately 400 feet of an existing signalized intersection. If possible, route path directly to the signal.
- Barriers and signing may be needed to direct shared use path users to the signalized crossings

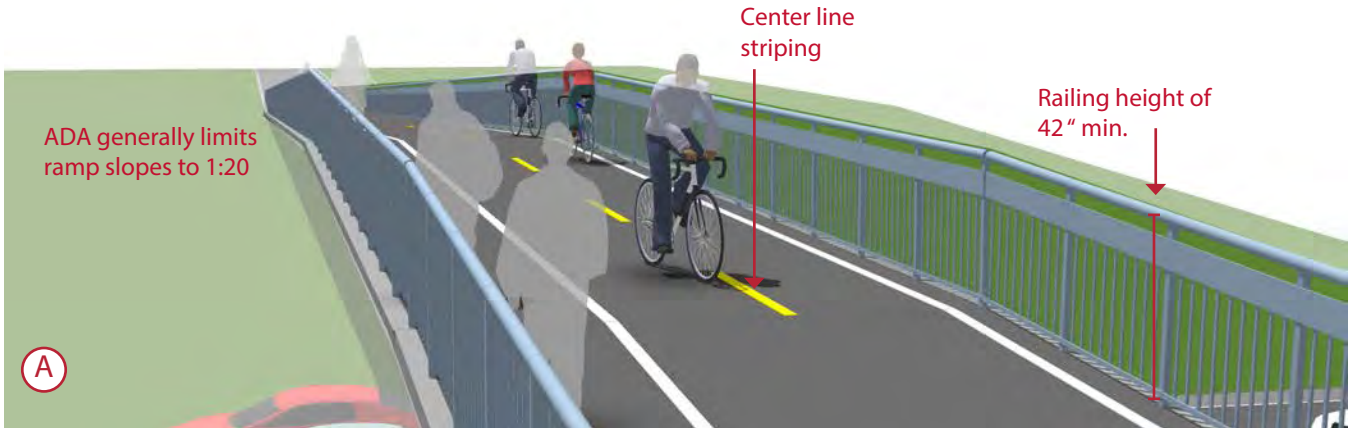
(C) SIGNAL CONTROLLED CROSSINGS

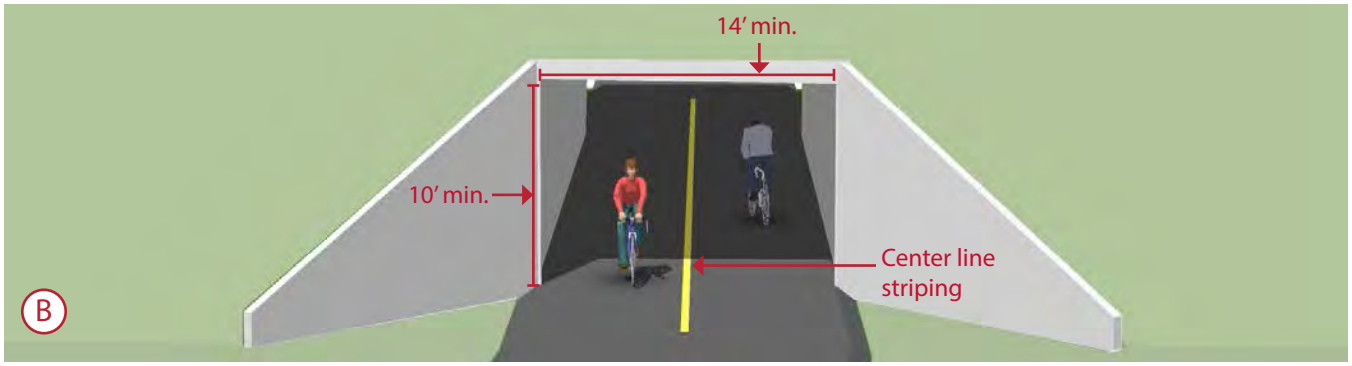
- Full traffic signal installations must meet MUTCD pedestrian, school or modified warrants.
- Located more than 300 feet from an existing signalized intersection
- Push button actuation for shared use path users
- The maximum delay for activation of the signal should be two minutes

SHARED USE PATH CROSSINGS

GRADE SEPARATED CROSSINGS

Grade separated crossings provide critical non-motorized system links by joining areas separated by barriers such as railroads, waterways and highway corridors. In most cases, these structures are built in response to user demand for safe crossings where they previously did not exist.





Typical Application

- There are no minimum roadway characteristics for considering grade separation. Depending on the type of facility or the desired user group grade separation may be considered in many types of projects.
- Overcrossings require a minimum of 17 feet of vertical clearance to the roadway below versus a minimum elevation differential of around 12 feet for an undercrossing. This results in potentially greater elevation differences and much longer ramps for bicycles and pedestrians to negotiate.

Designs Features

A OVERCROSSING:

- 14 feet width preferred, 8 foot minimum.
- If overcrossing has any scenic vistas additional width should be provided to allow for stopping.

B UNDERCROSSING:

- 14 foot minimum width, greater widths preferred for lengths over 60 feet.
- 10 foot minimum height.
- Lighting should be considered during the design process for any undercrossing.

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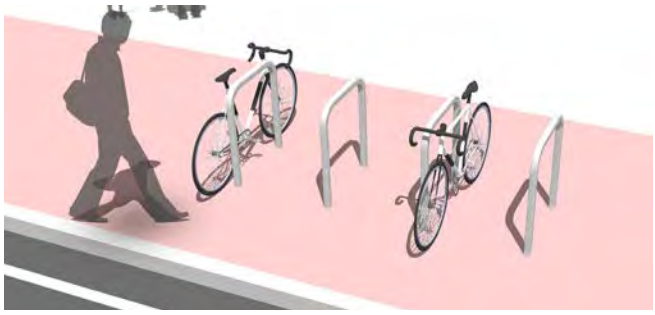
BICYCLE PARKING AND MAINTENANCE

BICYCLE SUPPORT FACILITIES

BIKE PARKING

Bicyclists expect a safe, convenient place to secure their bicycle when they reach their destination. This may be short-term parking of 2 hours or less, or long-term parking for employees, students, residents, and commuters.

Bike Racks



Bike Corral

Bike Locker

Secure Parking Area

Design Features

Bike Racks

- 2 feet minimum from the curb face to avoid 'dooring.'
- 4 feet between racks to provide maneuvering room.
- Locate close to destinations; 50 feet maximum distance from main entrance.
- Minimum clear distance of 6 feet should be provided between the bicycle rack and the property line.

Bike Corrals

- Bicyclists should have an entrance width from the roadway of 5-6 feet.
- Can also be used with angled parking.
- Parking stalls adjacent to curb extensions are good candidates for bicycle corrals since the concrete extension serves as delimitation on one side.

Bike Lockers

- Minimum dimensions: width (opening) 2.5 feet; height 4 feet; depth 6 feet.
- 4 foot side clearance and 6 foot end clearance. 7 foot minimum distance between facing lockers.

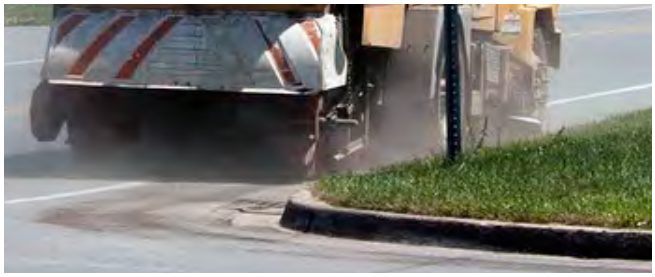
Secure Parking Area

- Closed-circuit television monitoring with secure access for users.
- Double high racks & cargo bike spaces.
- Bike repair station with bench and maintenance item vending machine.
- Bike lock "hitching post" – allows people to leave bike locks.

SWEEPING

Typical Application

Bicyclists often avoid shoulders and bike lanes filled with gravel, broken glass and other debris; they will ride in the roadway to avoid these hazards, potentially causing conflicts with motorists. Debris from the roadway should not be swept onto sidewalks (pedestrians need a clean walking surface), nor should debris be swept from the sidewalk onto the roadway. A regularly scheduled inspection and maintenance program helps ensure that roadway debris is regularly picked up or swept.



Further Considerations

- Establish a seasonal sweeping schedule that prioritizes roadways with major bicycle routes.
- Sweep walkways and bikeways whenever there is an accumulation of debris on the facility.
- In curbed sections, sweepers should pick up debris; on open shoulders, debris can be swept onto gravel shoulders.
- Pave gravel driveway approaches to minimize loose gravel on paved roadway shoulders.
- Perform additional sweeping in the Spring to remove debris from the Winter.
- Perform additional sweeping in the Fall in areas where leaves accumulate.

SIGNAGE

Typical Application

Bike lanes, shared shoulders, Bicycle Boulevards and paths all have different signage types for wayfinding and regulations. Such signage is vulnerable to vandalism or wear, and requires periodic maintenance and replacement as needed.

Further Considerations

- Check regulatory and wayfinding signage along bikeways for signs of vandalism, graffiti, or normal wear.
- Replace signage along the bikeway network as-needed.
- Perform a regularly-scheduled check on the status of signage with follow-up as necessary.
- Create a Maintenance Management Plan.

ROADWAY SURFACE

Typical Application

Bicycles are much more sensitive to subtle changes in roadway surface than are motor vehicles. Various materials are used to pave roadways, and some are smoother than others. Compaction is also an important issue after trenches and other construction holes are filled. Uneven settlement after trenching can affect the roadway surface nearest the curb where bicycles travel. Sometimes compaction is not achieved to a satisfactory level, and an uneven pavement surface can result due to settling over the course of days or weeks. When resurfacing streets, use the smallest chip size and ensure that the surface is as smooth as possible to improve safety and comfort for bicyclists.

Further Considerations

- Maintain a smooth pothole-free surface.
- Ensure that on new roadway construction, the finished surface on bikeways does not vary more than ¼".
- Maintain pavement so ridge buildup does not occur at the gutter-to-pavement transition or adjacent to railway crossings.
- Inspect the pavement 2 to 4 months after trenching construction activities are completed to ensure that excessive settlement has not occurred.
- If chip sealing is to be performed, use the smallest possible chip on bike lanes and shoulders. Sweep loose chips regularly following application.
- During chip seal maintenance projects, if the pavement condition of the bike lane is satisfactory, it may be appropriate to chip seal the travel lanes only. However, use caution when doing this so as not to create an unacceptable ridge between the bike lane and travel lane.

PAVEMENT OVERLAYS

Typical Application

Pavement overlays represent good opportunities to improve conditions for bicyclists if done carefully. A ridge should not be left in the area where bicyclists ride (this occurs where an overlay extends part-way into a shoulder bikeway or bike lane). Overlay projects also offer opportunities to widen a roadway, or to re-stripe a roadway with bike lanes.

Further Considerations

- Extend the overlay over the entire roadway surface to avoid leaving an abrupt edge.
- If the shoulder or bike lane pavement is of good quality, it may be appropriate to end the overlay at the shoulder or bike lane stripe provided no abrupt ridge remains.
- Ensure that inlet grates, manhole and valve covers are within ¼ inch of the finished pavement surface and are made or treated with slip resistant materials.
- Pave gravel driveways to property lines to prevent gravel from being tracked onto shoulders or bike lanes.

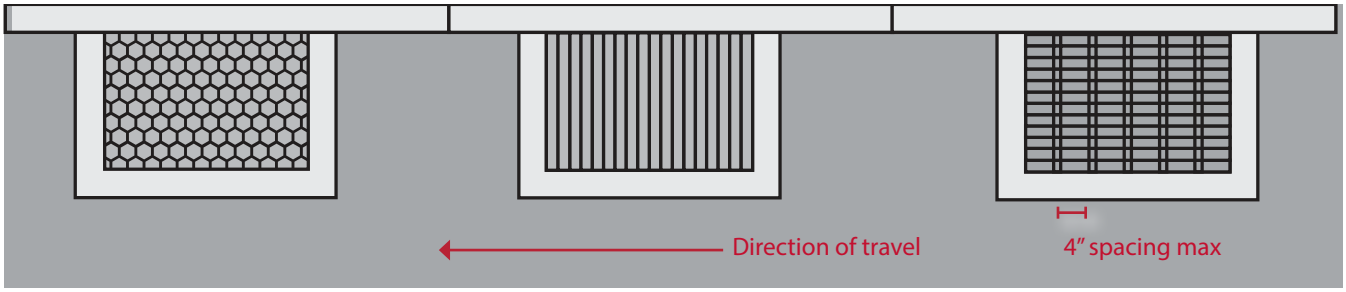
DRAINAGE GRATES

Typical Application

Drainage grates are typically located in the gutter area near the curb of a roadway. Drainage grates typically have slots through which water drains into the municipal storm sewer system. Many older grates were designed with linear parallel bars spread wide enough for a tire to become caught so that if a bicyclist were to ride on them, the front tire could become caught in the slot. This would cause the bicyclist to tumble over the handlebars and sustain potentially serious injuries.

Further Considerations

- Require all new drainage grates be bicycle-friendly, including grates that have horizontal slats on them so that bicycle tires and assistive devices do not fall through the vertical slats.
- Create a program to inventory all existing drainage grates, and replace hazardous grates as necessary – temporary modifications such as installing rebar horizontally across the grate should not be an acceptable alternative to replacement.



GUTTER TO PAVEMENT TRANSITION

Typical Application

On streets with concrete curbs and gutters, 1 to 2 feet of the curbside area is typically devoted to the gutter pan, where water collects and drains into catch basins. On many streets, the bikeway is situated near the transition between the gutter pan and the pavement edge. This transition can be susceptible to erosion, creating potholes and a rough surface for travel.The pavement on many streets is not flush with the gutter, creating a vertical transition between these segments. This area can buckle over time, creating a hazardous condition for bicyclists.

Further Considerations

- Ensure that gutter-to-pavement transitions have no more than a ¼" vertical transition.
- Examine pavement transitions during every roadway project for new construction, maintenance activities, and construction project activities that occur in streets.
- Inspect the pavement 2 to 4 months after trenching construction activities are completed to ensure that excessive settlement has not occurred.
- Provide at least 3 feet of pavement outside of the gutter seam.

LANDSCAPING

Typical Application

Bikeways can become inaccessible due to overgrown vegetation. All landscaping needs to be designed and maintained to ensure compatibility with the use of the bikeways. After a flood or major storm, bikeways should be checked along with other roads, and fallen trees or other debris should be removed promptly.

Further Considerations

- Ensure that shoulder plants do not hang into or impede passage along bikeways
- After major damage incidents, remove fallen trees or other debris from bikeways as quickly as possible

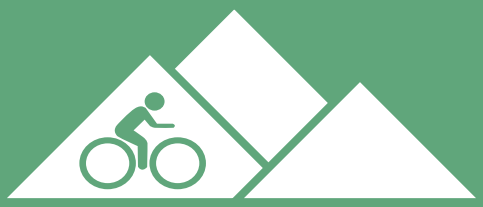
MAINTENANCE MANAGEMENT PLAN

Typical Application

Bikeway users need accommodation during construction and maintenance activities when bikeways may be closed or unavailable. Users must be warned of bikeway closures and given adequate detour information to bypass the closed section. Users should be warned through the use of standard signing approaching each affected section (e.g., “Bike Lane Closed,” “Trail Closed”), including information on alternate routes and dates of closure. Alternate routes should provide reasonable directness, equivalent traffic characteristics, and be signed.

Further Considerations

- Provide fire and police departments with map of system, along with access points to gates/bollards
- Enforce speed limits and other rules of the road
- Enforce all trespassing laws for people attempting to enter adjacent private properties



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Appendix F - Recommended Project Master Tables

LINEAR IMPROVEMENTS

NAME	FROM	TO	RECOMMENDED FACILITY	LENGTH (MILES)	IN CITY LIMITS?	WVDOH	BASE PRIORITIZATION SCORE	EASE OF IMPLEMENTATION	CONNECTIVITY SCORE	PRIORITIZATION TOTAL	IMPLEMENTATION STRATEGY	TOP 10	PHASE	COST (LOW)	COST (HIGH)	COST (LOW) + SOFT COST ESTIMATES	COST (HIGH) + SOFT COST ESTIMATES
Capitol St	Kanawha Blvd E	Smith St	Bicycle Boulevard	0.54	Yes	0	10	2	0	12	Addsignageandmarkings. Consider traffic calming	1	1	$3,600	$7,000	$5,700	$11,000
Summers St	Donnally St	Christopher St/CapitolSt	Bicycle Boulevard	0.14	Yes	0	10	2	0	12	Addsignageandmarkings. Consider traffic calming	1	1	$1,000	$1,900	$1,600	$3,000
Summers St	Washington St E	Donnally St	Bike Lane	0.1	Yes	0	10	2	0	12	4 to 3 lane road diet. Add bike lanes on both sides	1	1	$8,100	$12,900	$12,600	$20,100
Summers St	Kanawha Blvd E	Washington St E	Bicycle Boulevard	0.33	Yes	0	10	2	0	12	Addsignageandmarkings. Consider traffic calming	1	1	$2,200	$4,300	$3,500	$6,800
31st St Se, Virginia Ave,37th St SE	FrontageRd	Noyes Ave	Bicycle Boulevard	0.79	Yes	0	7	2	1	10	Addsignageandmarkings. Consider traffic calming	1	1	$5,200	$10,200	$8,200	$16,000
FrontageRd, 19th St SE, KanawhaAve SE,Shawnee Cir	Porter Rd	33rd St SE	Bicycle Boulevard	1.88	Yes	0	8	2	0	10	Addsignageandmarkings. Consider traffic calming	1	1	$12,200	$24,300	$19,100	$38,000
Noyes Ave, Noyes Ave Access	37th St SE	57th St SE	Bicycle Boulevard	2.28	Yes	0	6	3	1	10	Addsignageandmarkings. Consider traffic calming	1	1	$14,800	$29,400	$23,100	$45,900
SSideBridge	Virginia St	Bridge Rd	Bicycle Boulevard	0.25	Yes	0	8	2	0	10	Supersharrowsonoutside lanes and R4-11 sign	1	1	$1,700	$3,300	$2,700	$5,200
Virginia St E	Morris St	GreenbrierSt	Bicycle Boulevard	1.06	Yes	0	8	2	0	10	Addsignageandmarkings. Consider traffic calming	1	1	$6,900	$13,700	$10,800	$21,400
Virginia St E	Pennsylvania Ave N	Morris St	Cycle Track	1.24	Yes	0	9	1	0	10	Two-wayCycleTrackNSide ofRoadway.Removelane	1	1	$135,500	$205,500	$211,400	$320,600
Court St	Donnally St	Virginia St	Bike Lane	0.45	Yes	0	9	1	0	10	Reducelanewidthtoadd bike lanes or buff. lanes	0	1	$36,100	$57,500	$56,400	$89,700
Elizabeth St	PiedmontRd	Kanawha Blvd E	Bike Lane	0.52	Yes	0	9	1	0	10	Removeon-streetparking, add bike lanes	0	1	$41,600	$66,300	$64,900	$103,500
Lee St E	Morris St	Elizabeth St	Bicycle Boulevard	0.74	Yes	1	9	1	0	10	Addsignageandmarkings. Consider traffic calming	0	1	$4,800	$9,500	$7,500	$14,900
Morris St	PiedmontRd	Kanawha Blvd E	Bike Lane	0.73	Yes	0	9	1	0	10	Removecenterturnlaneor parking, add bike lanes	0	1	$59,000	$94,000	$92,100	$146,700
Ruffner Ave, Hansford St, Chiton St	PiedmontRd	Kanawha Blvd E	Bicycle Boulevard	0.73	Yes	0	8	2	0	10	Addsignageandmarkings. Consider traffic calming	0	1	$4,700	$9,400	$7,400	$14,700
Venable Ave	35th St SE	58th St SE	Bicycle Boulevard	2.30	Yes	0	7	3	0	10	Addsignageandmarkings. Consider traffic calming	0	1	$14,900	$29,600	$23,300	$46,200
WV State CapitolCam-pus	GreenbrierSt	SharedLane Connection	Bike Route	0.21	Yes	0	8	2	0	10	Signedbikeroutethrough capitol campus lot	0	1	$1,400	$2,800	$2,200	$4,400
39th St SE	Noyes Ave	Venable Ave	Bicycle Boulevard	0.14	Yes	0	6	2	1	9	Addsignageandmarkings. Consider traffic calming	1	1	$900	$1,800	$1,500	$2,900
Bullitt St	PiedmontRd	Slack St	Bike Lane	0.17	Yes	0	7	1	1	9	RemoveParkingOne-Side. Bike Lanes	1	1	$13,700	$21,800	$21,400	$34,100
Court St	PiedmontRd	Donnally St	Bike Lane	0.11	Yes	0	7	1	1	9	Downhill Sharrow, Uphill Bike Lane	1	1	$900	$6,400	$1,500	$10,000

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Hunt Ave	Washington St W	Beech Ave	Bicycle Boulevard	0.25	Yes	0	5	2	2	9	Add signage and markings. Consider traffic calming	1	1	$1,600	$3,200	$2,500	$5,000
Kanawha Blvd W, Kanawha Blvd E	Ohio Ave	Leon Sullivan Way	Cycle Track	1.22	Yes	1	9	0	0	9	Shared-use Path/Cycle Track along river	1	1	$2,020,900	$2,020,900	$2,020,900	$2,020,900
Kanawha Blvd W, Patrick St	5th Ave	Kanawha Blvd W	Cycle Track	0.39	Yes	1	9	0	0	9	Two-way Cycle Track on SB side of roadway	1	1	$43,300	$65,719	$67,600	$102,600
Patrick St	Kanawha Blvd W	MacCorckle Ave SW	Cycle Track	0.28	Yes	1	9	0	0	9	Two-way cycletrack on SB sideofroadway. 4to3lane road diet.	1	1	$30,700	$46,500	$47,900	$72,500
MacCorkle Ave SE	Frontage St	Thayer St	Shoulder Bikeway	1.13	Yes	1	6	2	1	9	Long-term SUP. Near-term, improve shoulder maint.	1	1	$-	$-	$-	$-
Myrtle Rd, Laurel Rd, Oakmont Rd, Walnut Rd, Bridge Rd	Crawford Rd	Moore Rd	Bicycle Boulevard	1.92	Yes	0	7	2	0	9	Add signage and markings. Consider traffic calming	1	1	$12,400	$24,700	$19,400	$38,600
Piedmont Rd	Bullitt St	Court St	Bike Lane	0.12	Yes	0	7	1	1	9	No parking both sides, Bike Lanes	1	1	$3,400	$6,600	$5,400	$10,300
Smith St	Capital St	Court St	Cycle Track	0.17	Yes	0	7	1	1	9	Two-way cycle track or shared-use path on NB side	1	1	$18,200	$27,600	$28,400	$43,100
Virginia St W	Washington St W	Pennsylvania Ave N	Cycle Track	0.89	Yes	0	8	1	0	9	Rem. parking one-side. Cycle Track N Side of Road	1	1	$97,700	$148,200	$152,500	$231,200
Washington St W	Hunt Ave	Russell St	Shared Lane Markings	0.05	Yes	1	5	1	3	9	Shared-roadway (long-term expand S side sidewalk)	1	1	$400	$800	$700	$1,300
35th St SE	MacCorkle Ave SE	Staunton Ave	Shared-Use Path	0.12	Yes	1	8	0	1	9	Rem. outside lane and install curb-separated path	0	1	$177,300	$177,300	$276,600	$276,600
35th St SE	Kanawha Blvd E	Staunton Ave	Shared-use Path	0.30	Yes	1	8	0	1	9	Improve safety and comfort of ex. path over bridge	0	1	$124,700	$148,100	$194,600	$231,100
35th St SE	Kanawha Blvd E	Staunton Ave	Shared-Use Path	0.30	Yes	1	8	0	1	9	Long-term, widen sidewalk along bridge for bikes	0	0	$-	$-	$-	$-
39th St SE, Lancaster Ave, 48th St SE, Washington Ave, 49th St SE, 56 St SE	39th Street	56th Street	Bicycle Boulevard	1.83	Yes	0	7	2	0	9	Add signage and markings. Consider traffic calming	0	1	$11,800	$23,600	$18,500	$36,900
7th Ave W	37th St W	Iowa St	Buffered Bike Lane	1.43	Yes	0	8	1	0	9	Remove on-street parking. Add buffered bike lanes	0	1	$118,500	$254,500	$184,900	$397,100
Cliffview Ave, Temple St, Clay Ave, Walnut Dr, Frame St, Stockton St	Washington St W	Washington St W	Bicycle Boulevard	0.50	Yes	0	7	2	0	9	Add signage and markings. Consider traffic calming	0	1	$3,300	$6,500	$5,200	$10,200
Columbia Ave, Pennsylvania Ave N	Lee St W	Kanawha Blvd W	Greenway Trail	0.39	Yes	0	8	1	0	9	Shared-use Path along river	0	1	$-	$-	$-	$-
Court St	Piedmont Rd	Donnally St	Bike Lane	0.06	Yes	0	7	1	1	9	Restripe for Bike Lanes	0	1	$500	$3,600	$800	$5,700

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Donnally St, ClendeninSt	Washington St E	Capitol Sr	Bicycle Boulevard	0.70	Yes	0	7	2	0	9	Add signage and markings. Consider traffic calming	0	1	$4,600	$9,000	$7,200	$14,100
Eastside Railroad	Slack St	PiedmontRd	Rail-with-Trail	1.15	Yes	0	8	1	0	9	RailwithTrail(northside of tracks)	0	1	$487,200	$578,500	$760,100	$902,500
Farnsworth Dr,SunsetDr, Hinton Ter	Slack St	PiedmontRd	Bicycle Boulevard	1.82	Yes	0	7	2	0	9	Add signage and markings. Consider traffic calming	0	1	$11,800	$23,400	$18,500	$36,600
Lee St E, Lee St W	Pennsylvania Ave N	Morris St	Cycle Track	1.34	Yes	1	9	0	0	9	Two-waycycletracknorth sideofroad.Removelane	0	1	$146,100	$221,600	$228,000	$345,700
LeonSullivan Way	Washington St E	Kanawha Blvd E	Bike Lane	0.56	Yes	0	8	1	0	9	Removeparkingone-side, add bike lanes	0	1	$44,800	$71,300	$69,900	$111,300
MacCorkle Ave SE	33rd St SE	DickinsonSt	Shoulder Bikeway	2.41	Yes	1	7	0	2	9	Improvedshouldermaintenance.	0	1	$-	$-	$-	$-
Park Ave	VirginiaStW	Kanawha Blvd W	Bicycle Boulevard	0.42	Yes	0	6	2	1	9	Add signage and markings. Consider traffic calming	0	1	$2,800	$5,500	$4,400	$8,600
Park Ave	Beech Ave	VirginiaStW	Bicycle Boulevard	0.38	Yes	0	6	2	1	9	Add signage and markings. Consider traffic calming	0	1	$2,500	$5,000	$3,900	$7,800
Patrick St	5th Ave	Washington St W	Bike Lane	0.21	Yes	1	7	0	2	9	Consider converting to two-way. Addbikelanes	0	1	$16,400	$21,500	$25,600	$33,600
Slack St	PiedmontRd	Barlow Dr	Bicycle Boulevard	0.51	Yes	0	7	2	0	9	Add signage and markings. Consider traffic calming	0	1	$3,400	$6,600	$5,400	$10,300
Smith St	Capital St	Brooks St	Bike Lane	0.26	Yes	0	8	1	0	9	Restripe for bike lanes	0	1	$21,000	$33,400	$32,800	$52,200
Smith St	Brood St	Ruffner Ave	SharedLaneMarkings	0.38	Yes	0	7	2	0	9	Stripeshared-lanemarkings and add STR signs.	0	1	$2,500	$4,900	$3,900	$7,700
Stuart St, Hendrix Ave, Washington St W	Stockton St	Hunt Ave	Bicycle Boulevard	0.44	Yes	0	7	2	0	9	Add signage and markings. Consider traffic calming	0	1	$2,900	$5,700	$4,600	$8,900
Tennessee Ave	Kanawha Blvd W	Washington St W	Bike Lane	0.44	Yes	0	8	1	0	9	Addbikelanes(withbuffer on parking side)	0	1	$35,400	$56,400	$55,300	$88,000
Two-Mile Creek	Railroad	School St	Shared-Use Path	1.01	Yes	0	8	0	1	9	Constructshared-usepath	0	1	$426,800	$506,900	$665,900	$790,800
Washington St E	Morris St	GreenbrierSr	Bike Lane	0.87	Yes	1	9	0	0	9	BikeLaneWB-SharrowEB (Middle of roadway)	0	1	$6,600	$48,100	$10,300	$75,100
Washington St E	Kanawha Blvd E	Chesapeake Ave	Cycle Track	0.33	Yes	1	5	0	4	9	RemoveparkingSsideof road.Two-wayCycleTrack	0	1	$36,400	$55,200	$56,800	$86,200
Washington St W	Iowa St	Griffin Dr	Cycle Track	0.03	Yes	1	7	0	2	9	Removeoutsidelane-two way cycle track	0	1	$3,300	$5,000	$5,200	$7,800
Washington St W	Iowa St	Patrick St	Shared-Use Path	0.18	Yes	1	7	0	2	9	InstallSidepathonSside of roadway.	0	1	$78,100	$92,800	$121,900	$144,800
WV State CapitolCampus	GreenbrierSt	CaliforniaAve	Bike Route	0.29	Yes	0	7	2	0	9	Signedbikeroutethrough capitol campus	0	1	$1,900	$3,700	$3,000	$5,800
2nd Ave, Russell St, Grant St	Kanawha Blvd W	Park Ave	Bicycle Boulevard	0.82	Yes	0	6	2	0	8	Add signage and markings. Consider traffic calming	0	2	$5,400	$10,600	$8,500	$16,600

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7th Ave	Patrick St	VirginiaStW	Bike Lane	0.71	Yes	0	7	1	0	8	Rem. parking one side. May need SLM's W of Florida	0	2	$57,000	$90,800	$89,000	$141,700
7th Ave	Iowa St	Patrick St	SharedLaneMarkings	0.22	Yes	0	6	2	0	8	Stripeshared-lanemarkings and add STR signs.	0	2	$1,500	$2,900	$2,400	$4,600
Baker Lin	EdgewoodDr	End	Bicycle Boulevard	0.57	Yes	0	5	2	1	8	Add signage and markings. Consider traffic calming	0	2	$3,700	$7,400	$5,800	$11,600
Barlow Dr	Twilight Dr	Sidepath	Bicycle Boulevard	2.18	No	0	6	2	0	8	Add signage and markings. Consider traffic calming	0	2	$14,100	$28,100	$22,000	$43,900
Barton St	Beech Ave	Washington St W	Bicycle Boulevard	0.23	Yes	0	6	2	0	8	Add signage and markings. Consider traffic calming	0	2	$1,500	$3,000	$2,400	$4,700
Beech Ave, Chester Rd, Swarthmore Ave	Hunt Ave	GreendaleDr	Bicycle Boulevard	0.82	Yes	0	5	2	1	8	Add signage and markings. Consider traffic calming	0	2	$5,300	$10,500	$8,300	$16,400
Beech Ave, Livingston Ave	Barton St	Hunt Ave	Bicycle Boulevard	0.24	Yes	0	6	2	0	8	Add signage and markings. Consider traffic calming	0	2	$1,600	$3,100	$2,500	$4,900
ChandlerDr, Arnold Dr, WhiteOakRd	StonewallDr	School St	Bike Route	1.11	Yes	0	7	1	0	8	Add signage and pavement markings	0	2	$7,200	$14,300	$11,300	$22,400
ClendeninSt	Washington St E	Kanawha Blvd E	Bike Lane	0.34	Yes	0	7	1	0	8	4laneto3laneroaddiet-add bike lanes	0	2	$27,400	$43,700	$42,800	$68,200
Court St	Virginia St E	Kanawha Blvd E	Bike Lane	0.07	Yes	0	7	1	0	8	Reduceonelaneoftraffic, add bike lanes	0	2	$5,900	$9,300	$9,300	$14,600
DelawareAve	Washington St W	VirginiaStW	Bike Lane	0.32	Yes	0	7	1	0	8	Rem. parking one side, add bike or buff. lanes	0	2	$26,000	$41,300	$40,600	$64,500
Edgewood Dr, WoodRd	Baker Lane	Edgewood Elementary	Bicycle Boulevard	0.71	Yes	0	6	2	0	8	Add signage and markings. Consider traffic calming	0	2	$4,700	$9,200	$7,400	$14,400
Florida St	Washington St W	Kanawha Blvd W	Bicycle Boulevard	0.50	Yes	0	6	2	0	8	Add signage and markings. Consider traffic calming	0	2	$3,300	$6,500	$5,200	$10,200
GreenbrierSt	AirportRoad	Washington Street	Shoulder Bikeway	1.75	Yes	1	8	0	0	8	Maintenance improvementsonexistingshoulders.	0	2	$739,600	$878,300	$1,153,800	$1,370,200
GreendaleDr	Swarthmore Ave	Washington St W	Bicycle Boulevard	0.37	Yes	0	6	2	0	8	Add signage and markings. Consider traffic calming	0	2	$2,400	$4,800	$3,800	$7,500
HamptonRd, SRuffnerRd	Loudon HeightsRoad	MacCorkle Avenue	Bike Route	2.75	Yes	0	7	1	0	8	Add signage and pavement markings	0	2	$17,800	$35,400	$27,800	$55,300
Kanawha Blvd E	LeonSullivan Way	Chesapeake Ave	Cycle Track	1.87	Yes	1	8	0	0	8	Shared-use Path/Cycle Track along river	0	2	$2,799,700	$2,799,700	$2,799,700	$2,799,700
Kanawha Blvd E	Chesapeake Ave	35th St	Bicycle Boulevard	0.33	Yes	1	8	0	0	8	Add signage and markings. Consider traffic calming	0	2	$2,200	$4,300	$3,500	$6,800
Kanawha Blvd W	Kanawha Blvd W	Ohio Ave	Cycle Track	1.07	Yes	0	7	1	0	8	Shared-use Path/Cycle Track along river (programmed)	0	0	$-	$-	$-	$-

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N Rand St	Court St	End	Bicycle Boulevard	0.17	Yes	0	6	2	0	8	Add signage and markings. Consider traffic calming	0	2	$1,200	$2,300	$1,900	$3,600
Oakridge Dr	Ellette Dr	Wertz Ave	Bicycle Boulevard	0.97	Yes	0	6	2	0	8	Add signage and markings. Consider traffic calming	0	2	$6,300	$12,500	$9,900	$19,500
Ohio Ave	Washington St W	Kanawha Blvd W	Bike Lane	0.52	Yes	0	7	1	0	8	Rem. parking one side, add bike or buff. lanes	0	2	$41,900	$66,700	$65,400	$104,100
Pennsylvania Ave S, Bugley Ave	Kanawha Blvd W	Market Dr	Cycle Track	0.92	Yes	1	8	0	0	8	Two-way Cycle Track. Requires spot parking rem.	0	2	$100,800	$152,900	$157,300	$238,600
Piedmont Rd	Court St	Leon Sullivan Way	Bicycle Boulevard	0.27	Yes	0	6	2	0	8	Add signage and markings. Consider traffic calming	0	2	$1,800	$3,500	$2,900	$5,500
Piedmont Rd	Elizabeth St	Greenbrier St	Bike Lane	0.22	Yes	0	7	1	0	8	Restripe to add 6' Bike Lanes	0	2	$16,600	$21,800	$25,900	$34,100
Piedmont Rd	Slack St	Farnsworth Dr	Buffered Bike Lane	0.47	Yes	0	7	1	0	8	Restripe for Buffered Bike Lanes	0	2	$4,800	$49,600	$7,500	$77,400
Piedmont Rd	Farnsworth Dr	Elizabeth St	Shared Lane Markings	0.44	Yes	0	6	2	0	8	Stripe shared-lane markings and add STR signs.	0	2	$2,900	$5,800	$4,600	$9,100
Porter Rd, Bendview Dr, Loudon Hights Rd,	Frontage Rd	Connell Rd	Bicycle Boulevard	2.37	Yes	0	6	2	0	8	Add signage and markings. Consider traffic calming	0	2	$15,400	$30,600	$24,100	$47,800
S Park Rd, 33rd St SE	Virginia Ave	MacCorkle Ave SE	Bicycle Boulevard	0.29	Yes	0	6	2	0	8	Add signage and markings. Consider traffic calming	0	2	$1,900	$3,700	$3,000	$5,800
Somerset Dr, Summit Dr, Stonewall Dr	Edgewood Dr	Beech Ave	Bicycle Boulevard	0.78	Yes	0	6	2	0	8	Add signage and markings. Consider traffic calming	0	2	$5,100	$10,000	$8,000	$15,600
South-West-side Railroad	Madison St	MacCorkle Ave SW	Rail-with-Trail	0.73	Yes	0	7	1	0	8	Rail Trail	0	2	$307,400	$365,000	$479,600	$569,400
Twilight Drive, Green St	Barlow Drive	Association Drive	Bicycle Boulevard	0.91	Yes	0	6	2	0	8	Add signage and markings. Consider traffic calming	0	2	$5,900	$11,800	$9,300	$18,500
Washington St E, Wertz Ave	Kanawha Blvd E	Darby St	Bike Lane	0.20	Yes	1	6	0	2	8	Restripe for bike lanes.	0	2	$1,600	$11,100	$2,500	$17,400
Washington St W	Ohio Ave	Tennessee Ave	Bicycle Boulevard	0.09	Yes	0	6	2	0	8	Add signage and markings. Consider traffic calming	0	2	$700	$1,300	$1,100	$2,100
Watts St, Crescent Rd	Washington St W	Costello St	Bicycle Boulevard	0.32	Yes	0	6	2	0	8	Add signage and markings. Consider traffic calming	0	2	$2,100	$4,100	$3,300	$6,400
Wertz Ave	Oakridge Dr	Darby St	Bicycle Boulevard	1.33	Yes	0	6	2	0	8	Add signage and markings. Consider traffic calming	0	2	$8,700	$17,200	$13,600	$26,900
Westside Railroad	Two-Mile Creek	Elk River	Rail-with-Trail	2.63	Yes	0	7	1	0	8	Rail Trail	0	2	$1,110,800	$1,319,100	$1,732,900	$2,057,800
4th Ave	Patrick St	Stockton St	Bike Lane	0.16	Yes	0	6	1	0	7	Remove N side lane and add bike lanes	0	3	$13,200	$16,500	$20,600	$25,800

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4th Ave, Central Ave	Stockton St	Virginia St W	Bike Lane	0.94	Yes	0	6	1	0	7	Remove N side parking and add bike lanes	0	3	$75,500	$120,300	$117,800	$187,700
Abney Cir	Bridge Rd	Norwood Rd	Bicycle Boulevard	0.10	Yes	0	5	2	0	7	Add signage and markings. Consider traffic calming	0	3	$700	$1,400	$1,100	$2,200
Clark Rd, Skyline Rd, Teter Rd	Autumn Rd	Presidential Dr	Bicycle Boulevard	0.97	Yes	0	5	2	0	7	Add signage and markings. Consider traffic calming	0	3	$6,300	$12,600	$9,900	$19,700
Delaware Ave	Virginia St W	Kanawha Blvd W	Bicycle Boulevard	0.25	Yes	0	5	2	0	7	Add signage and markings. Consider traffic calming	0	3	$1,700	$3,300	$2,700	$5,200
Elk River	Kanawha Blvd E	Court St	Shared-Use Path	1.08	Yes	0	7	0	0	7	Construct shared-use path	0	3	$458,000	$543,900	$714,500	$848,500
Ferry St	Dickinson St	MacCorkle Connector	Bicycle Boulevard	0.15	Yes	0	5	2	0	7	Add signage and markings. Consider traffic calming	0	3	$1,000	$1,900	$1,600	$3,000
Fledderjohn Rd, Hodges Rd	Emerald Rd	Hodges Rd	Bicycle Boulevard	0.28	Yes	0	5	2	0	7	Add signage and markings. Consider traffic calming	0	3	$1,900	$3,700	$3,000	$5,800
Grant St, Berkeley St	Park Ave	Kanawha Blvd W	Bicycle Boulevard	0.47	Yes	0	5	2	0	7	Add signage and markings. Consider traffic calming	0	3	$3,100	$6,100	$4,900	$9,600
Greenmeadow Rd, Newcastle Rd, Wilkie Dr	Oakhurst Dr	Cantley Dr	Bicycle Boulevard	0.99	Yes	0	5	2	0	7	Add signage and markings. Consider traffic calming	0	3	$6,400	$12,700	$10,000	$19,900
Hillcrest Dr, Centers Rd, Houghton Dr, YMCA Dr	Greenbrier St	Greenbrier St	Bike Lane	1.58	Yes	1	7	0	0	7	Uphill Bike Lane, downhill shared lane	0	3	$12,000	$87,400	$18,800	$136,400
Iowa St, 5th Ave	Washington St W	Patrick St	Cycle Track	0.49	Yes	1	7	0	0	7	Reduce lane width, add 2way cycletrack to outside	0	3	$53,900	$81,700	$84,100	$127,500
Lee St W	Washington St W	Pennsylvania Ave N	Cycle Track	0.49	Yes	0	6	1	0	7	Two-way Cycle Track. Rem. parking or lane one-side	0	3	$53,200	$80,700	$83,000	$125,900
Loudon Heights Rd	Justice Row	Short Dr	Bicycle Boulevard	0.90	Yes	0	5	2	0	7	Add signage and markings. Consider traffic calming	0	3	$5,900	$11,700	$9,300	$18,300
Oakridge Dr	Greenbrier St	Ellette Dr	Bike Lane	0.50	Yes	0	6	1	0	7	Widen road, add bike lanes.	0	3	$3,800	$27,600	$6,000	$43,100
Price St, Costello St, Dayton Dr	Greendale Dr	Crescent Rd	Bicycle Boulevard	0.73	Yes	0	5	2	0	7	Add signage and markings. Consider traffic calming	0	3	$4,800	$9,500	$7,500	$14,900
S Park Rd, Cane Fork Rd	MacCorkle Ave SE	Kanawha State Forest Dr	Bike Route	4.94	No	0	6	1	0	7	Add signage and pavement markings	0	3	$32,000	$63,600	$50,000	$99,300
Smith Rd, Autumn Rd	Bridlewood Rd	Clark Rd	Bicycle Boulevard	1.67	Yes	0	5	2	0	7	Add signage and markings. Consider traffic calming	0	3	$10,800	$21,500	$16,900	$33,600
Stockton St	Washington St W	Kanawha Blvd	Bicycle Boulevard	0.50	Yes	0	5	2	0	7	Add signage and markings. Consider traffic calming	0	3	$3,300	$6,500	$5,200	$10,200
Tennis Club Rd, Presidential Dr	Oakwood Rd	Teter Rd	Bicycle Boulevard	0.94	Yes	0	5	2	0	7	Add signage and markings. Consider traffic calming	0	3	$6,100	$12,100	$9,600	$18,900

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Viewmont Dr,GilbertDr, Garvin Ave	Beech Ave	Summit Dr	Bicycle Boulevard	0.68	Yes	0	5	2	0	7	Add signage and markings. Consider traffic calming	0	3	$4,400	$8,800	$6,900	$13,800
Washington St E	CaliforniaAve	Chesapeake Ave	SharedLaneMarkings	0.35	Yes	1	6	1	0	7	Stripeshared-lanemarkings and add STR signs.	0	3	$2,300	$4,600	$3,600	$7,200
29th St W	7th Ave W	Blaine Blvd	Bicycle Boulevard	0.28	Yes	0	4	2	0	6	Add signage and markings. Consider traffic calming	0	3	$1,900	$3,700	$3,000	$5,800
4th Ave W	26th St W	End	Bicycle Boulevard	0.20	Yes	0	4	2	0	6	Add signage and markings. Consider traffic calming	0	3	$1,300	$2,600	$2,100	$4,100
5th Ave W	35th St W	26th St W	Bicycle Boulevard	0.51	Yes	0	4	2	0	6	Add signage and markings. Consider traffic calming	0	3	$3,300	$6,600	$5,200	$10,300
BuchananSt	CrescentRd	Bigley Ave	Bicycle Boulevard	0.13	Yes	0	4	2	0	6	Add signage and markings. Consider traffic calming	0	3	$900	$1,700	$1,500	$2,700
Chesapeake Ave	Washington St E	Kanawha Blvd E	Bicycle Boulevard	0.08	Yes	0	4	2	0	6	Add signage and markings. Consider traffic calming	0	3	$600	$1,100	$1,000	$1,800
Edgewood Dr, Garrison Ave	Wood Road	Pennsylvania Avenue	Bike Route	1.83	Yes	0	5	1	0	6	Add signage and pavement markings	0	3	$11,900	$23,600	$18,600	$36,900
Elk River	Railroad	KeystoneDr	Shared-Use Path	1.48	Yes	0	6	0	0	6	Constructshared-usepath	0	3	$625,100	$742,300	$975,200	$1,158,000
Fledderjohn Rd	Hodges Rd	OakhurstDr	Bike Lane	0.20	Yes	0	5	1	0	6	Remove median and restripe for bike lanes	0	3	$16,300	$26,000	$25,500	$40,600
Gordon Dr	Kanawha Tpke	Stratford Pl	Bicycle Boulevard	1.08	Yes	0	4	2	0	6	Add signage and markings. Consider traffic calming	0	3	$7,100	$14,000	$11,100	$21,900
Gordon Dr, Wilkie Dr, Cantley Dr	Fort Hill Dr	Stradford Pl	Bicycle Boulevard	1.64	Yes	0	4	2	0	6	Add signage and markings. Consider traffic calming	0	3	$10,700	$21,200	$16,700	$33,100
Hickory Rd, Carroll Rd, OakwoodRd	OakwoodRd	Ravinia Rd	Bicycle Boulevard	0.96	Yes	1	5	1	0	6	Add signage and markings. Consider traffic calming	0	3	$6,200	$12,400	$9,700	$19,400
Hodges Rd	Bowers Rd	Fledderjohn Rd	Bicycle Boulevard	0.29	Yes	0	4	2	0	6	Add signage and markings. Consider traffic calming	0	3	$1,900	$3,700	$3,000	$5,800
Hodges/ Smith Rd Connector	Hodges Rd	Smith Rd	Shared-Use Path	0.12	Yes	0	5	0	1	6	Constructshared-usepath cut through	0	3	$50,700	$60,200	$79,100	$94,000
LongwoodDr	S Fort Dr	End	Bicycle Boulevard	0.11	Yes	0	2	2	2	6	Add signage and markings. Consider traffic calming	0	3	$800	$1,500	$1,300	$2,400
Loudon Heights Rd,	Short Dr	Connell Rd	Bicycle Boulevard	1.12	Yes	0	4	2	0	6	Add signage and markings. Consider traffic calming	0	3	$7,300	$14,500	$11,400	$22,700
OakwoodDr	LawndaleLn	Cantley Dr	Bicycle Boulevard	1.14	Yes	1	5	1	0	6	Add signage and markings. Consider traffic calming	0	3	$7,400	$14,700	$11,600	$23,000

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OakwoodRd, Ravinia Rd, Moore Rd, NorwoodRd, Abney Cir N, Short Dr	Clark Rd	Loundon Heights Rd	Bicycle Boulevard	1.30	Yes	1	5	1	0	6	Add signage and markings. Consider traffic calming	0	3	$8,500	$16,800	$13,300	$26,300
PiedmontRd, CaliforniaAve	GreenbrierSt	Kanawha Blvd E	Bike Lane	0.48	Yes	1	6	0	0	6	AddBikeLanes.NBparking removal S of Wash	0	3	$38,200	$60,800	$59,600	$94,900
Two-Mile Creek	School St	NeighborsDr	Shared-Use Path	0.94	Yes	0	6	0	0	6	Extendshared-usepath	0	3	$395,500	$469,600	$617,000	$732,600
Wilkie Dr, SheridanCir, McKinleyAve, Ashby Ave	Fort Hill Dr	S Fort Dr	Bicycle Boulevard	0.91	Yes	0	4	2	0	6	Add signage and markings. Consider traffic calming	0	3	$5,900	$11,800	$9,300	$18,500
35thStW,3rd Ave W	7th Ave W	29th St W	Bicycle Boulevard	0.42	Yes	0	3	2	0	5	Add signage and markings. Consider traffic calming	0	4	$2,800	$5,400	$4,400	$8,500
Airport Rd	Yeager Airport	Route 114	Bike Route	1.40	Yes	1	5	0	0	5	Add signage and pavement markings	0	4	$9,100	$18,100	$14,200	$28,300
Association Dr	Oak Ridge Center	DeitrickBoulevard	Bicycle Boulevard	0.32	Yes	0	3	2	0	5	Add signage and markings. Consider traffic calming	0	4	$2,100	$4,200	$3,300	$6,600
BlackwellDr	End of Road	Route 22	Bike Route	0.16	Yes	0	4	1	0	5	Add signage and pavement markings	0	4	$1,100	$2,200	$1,800	$3,500
Connell Rd, Kanawha State Forest Dr	Loudon Heights Rd	State Forest	Bike Route	4.62	Yes	0	4	1	0	5	Add signage and pavement markings	0	4	$29,900	$59,500	$46,700	$92,900
Cut-Through	GreenStreet	Association Drive	Bike/PedCut-Through	0.08	Yes	0	4	1	0	5	AssociationDriveBike/Ped Cut-Through	0	4	$-	$-	$-	$-
Danner Rd	Kanawha Tpke	End	Bicycle Boulevard	0.23	Yes	0	3	2	0	5	Add signage and markings. Consider traffic calming	0	4	$1,600	$3,100	$2,500	$4,900
Davis Creek Rd, Clark Rd	Oalhurst Dr	Skyline Rd	Bike Route	3.57	No	0	4	1	0	5	Add signage and pavement markings	0	4	$23,100	$46,000	$36,100	$71,800
EdgewoodDr	Washington St W	Baker Ln	Shared-Use Path	1.05	Yes	0	5	0	0	5	ConstructShared-usepath along trolly ROW.	0	4	$444,100	$527,400	$692,800	$822,800
GreenbrierSt	Capital High School	AirportRoad	Buffered Bike Lane	1.73	No	1	5	0	0	5	Reducelaneandmedian width,addbufferedlanes	0	4	$143,000	$307,100	$223,100	$479,100
Kanawha Tpke	MacCorkle Ave	MountainRd	Shared-Use Path	0.98	Yes	1	5	0	0	5	Upgradeexistingsidewalk to shared-use path	0	4	$416,000	$493,900	$649,000	$770,500
MacCorkle Ave SE	72nd St SE	58th St SE	Cycle Track	1.28	Yes	1	5	0	0	5	Rem.medianoraddwidth. Alternatively, sidepath	0	4	$138,700	$199,300	$216,400	$311,000
MacCorkle Ave SE	DickinsonSt	Patrick St	Shoulder Bikeway	2.20	Yes	1	5	0	0	5	Maintenance improvementsonexistingshoulders.	0	4	$-	$-	$-	$-
MacCorkle Ave SW	Rail Road	Kanawha Tpke	Bicycle Boulevard	0.32	Yes	1	4	1	0	5	Add signage and markings. Consider traffic calming	0	4	$2,100	$4,200	$3,300	$6,600
NeighborsDr, HampshireDr	SissonvilleDr	End	Bicycle Boulevard	0.34	Yes	0	3	2	0	5	Add signage and markings. Consider traffic calming	0	4	$2,300	$4,500	$3,600	$7,100

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Shared-Use Path	Oakhurst Dr	Weberwood Dr	Shared-Use Path	0.55	No	0	5	0	0	5	ConstructShared-UsePath	0	4	$230,700	$273,900	$359,900	$427,300
SissonvilleDr	Chandler Dr	City Limit	Shoulder Bikeway	1.88	Yes	1	5	0	0	5	Formalize and maintain shoulders for bikes.	0	4	$14,200	$103,700	$22,200	$161,800
Stratford Pl	Gordon Dr	Sidepath	Bicycle Boulevard	0.71	No	0	3	2	0	5	Add signage and markings. Consider traffic calming	0	4	$4,600	$9,200	$7,200	$14,400
Washington St W	Barton St	Florida St	SharedLaneMarkings	0.06	Yes	1	4	1	0	5	Shared-roadway (long-term expand S side sidewalk)	0	4	$400	$800	$700	$1,300
Woodhaven Dr, Woodward Dr,26th St W	4th Ave W	Headley Dr	Bike Route	1.49	Yes	1	5	0	0	5	Add signage and pavement markings	0	4	$9,700	$19,200	$15,200	$30,000
Bigley Ave, Market Dr	Crescent Rd	Pennsylvania Ave	Buffered Bike Lane	0.47	Yes	1	4	0	0	4	Removeparkingandadd Buffered Bike Lanes	0	4	$38,900	$83,500	$60,700	$130,300
DeitrickBlvd	GreenbrierSt	Kenton Dr	Bike Lane	0.55	Yes	0	3	1	0	4	RestripeforBikeLanesor Buffered Bike Lanes	0	4	$44,300	$70,500	$69,200	$110,000
Fort Hill Dr	Cantley Dr	Ashby Ave	Buffered Bike Lane	0.58	Yes	0	3	1	0	4	Restripe Buffered Bike Lane	0	4	$5,900	$61,100	$9,300	$95,400
Pennsylvania Ave	Bigley Ave	Lilly St	Bike Lane	0.67	Yes	0	3	1	0	4	Stripe Bike Lanes	0	4	$5,100	$37,000	$8,000	$57,800
Thayer St, Ferry St	MacCorkle Ave Se	Ferry St	Bike Lane	0.33	Yes	1	4	0	0	4	Removecenterturnlane, add bike lanes	0	4	$26,700	$42,600	$41,700	$66,500
Wayside Dr	Geary Dr	Danner Rd	Shared-Use Path	0.92	Yes	0	4	0	0	4	Constructshared-usepath	0	4	$390,700	$463,900	$609,500	$723,700
Westmoreland Rd	ClaireStreet	Pennsylvania Avenue	Bicycle Boulevard	0.51	Yes	0	2	2	0	4	Add signage and markings. Consider traffic calming	0	4	$3,300	$6,600	$5,200	$10,300
Elk River	Barlow Dr	CoonskinDr	Shared-Use Path	1.05	No	0	3	0	0	3	Formalize Shared-Use Path,stonedustorasphalt	0	4	$444,800	$528,200	$693,900	$824,000
MontroseDr	Weberwood Dr	Kanawha Tpke	Bicycle Boulevard	1.16	No	0	1	2	0	3	Add signage and markings. Consider traffic calming	0	4	$7,500	$14,900	$11,700	$23,300
OakhurstDr, JeffersonRd	UnitedDicaples Dr	MarshallWay	Bicycle Boulevard	1.76	No	1	2	1	0	3	Add signage and markings. Consider traffic calming	0	4	$11,400	$22,600	$17,800	$35,300
Pennsylvania Ave	City Limit	NewhouseDr	Shoulder Bikeway	0.86	No	0	2	1	0	3	Formalize and maintain shoulders for bikes.	0	4	$6,500	$47,700	$10,200	$74,500
Pennsylvania Ave	Lilly St	City Limit	Shoulder Bikeway	0.18	Yes	0	2	1	0	3	Formalize and maintain shoulders for bikes	0	4	$1,400	$9,900	$2,200	$15,500
Weberwood Dr	BicycleBlvd	Sidepath	Bicycle Boulevard	0.14	No	0	1	2	0	3	Add signage and markings. Consider traffic calming	0	4	$900	$1,800	$1,500	$2,900
Homewood Rd	Danner Rd	Danner MeadowPark	Shared-Use Path	0.12	Yes	0	2	0	0	2	Constructshared-usepath connection to park	0	4	$50,100	$59,500	$78,200	$92,900
Kanawha Tpke	City Limit	Joplin Park	Shared-Use Path	0.86	No	0	2	0	0	2	Upgradeexistingsidewalk to shared-use path	0	4	$361,500	$429,300	$564,000	$669,800
Pennsylvania Ave	Conner Dr	NewhouseDr	Bike Route	0.69	No	0	1	1	0	2	Add signage and pavement markings	0	4	$4,500	$8,900	$7,100	$13,900
Pennsylvania Ave	Coonskin Park Bridge	ConnerDrive	Bike Route	1.57	Yes	0	1	1	0	2	Add signage and pavement markings	0	4	$10,200	$20,300	$16,000	$31,700

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Weberwood Dr	Geary Rd	Weberwood Dr	Bike Lane	0.16	No	0	1	1	0	2	UphillBikeLane;Downhill Sharrow	0	4	$1,300	$9,000	$2,100	$14,100
JoplinBranch	Kanawha Tpke	Geary Rd	Shared-Use Path	1.00	No	0	1	0	0	1	Constructshared-usepath	0	0	$421,100	$500,100	$657,000	$780,200
7th Ave	Iowa St	Patrick St	One-Way to Two-Way Conversion	0.35	Yes	0	7	1	0	0	Converttotwo-waytraffic	0	0	$-	$-	$-	$-
Iowa St, 5th Ave	7th Ave	Patrick St	One-Way to Two-Way Conversion	0.34	Yes	1	7	0	0	0	Converttotwo-waytraffic	0	0	$-	$-	$-	$-
Washington St E	Reynolds St	Morris St	Other	0.99	Yes	1	8	0	0	0	Considerremovingalane toaddon-streetparking	0	0	$-	$-	$-	$-
35th St SE	Pennsylvania Avenue	Coonskin Park	Bike Lane	0.19	Yes	0	1	0	0	0	Bike Lanes included as partofbridgeconstruction	0	0	$-	$-	$-	$-
ConnerDrive Greenway	ConnerDrive	Pennsylvania Ave	Long-term Improve-ment:Shared-UsePath	.40	No						Constructshared-usepath	0	0	$-	$-	$-	$-
ConnerDrive	Pennsylvania Ave	ConnorDrive Greenway	Long-term Improve-ment:BicycleBoulevard	.63	No						Add signage and mark-ings. Consider traffic calming	0	0	$-	$-	$-	$-
Elk River Greenway	Keystone Drive	End of Pro-posedBicycle Boulevard	Long-term Improve-ment: Share-Use Path	1.25	No						Construct rail with trail	0	0	$-	$-	$-	$-

SPOT IMPROVEMENTS

OBJECTID	NAME	RECOMMENDED IMPROVEMENT	CROSS STREET 1	CROSS STREET 2
1	Intersection Improvements	Intersection Improvements	Jefferson Rd	Hwy 119
2	Intersection Improvements	Intersection Improvements	Emerald Rd	Hwy 119
2	Maintain Bike/Ped Access to Coonskin Park		Coonskin Dr	Entrance to Coonskin Park
4	Long-term, move bridge connection to Kanawha Blvd when reconstruction occurs		Washington St	East Ave, Wertz Ave
5	Bike/Ped Cut Through	Bicycle/Pedestrian Cut-Through	58th St SE	MacCorkle Ave, Chesterfield Ave
6	Traffic Diverter	Intersection Improvements	Randolph St	Delaware Ave
7	40′ Cross Section - Parking Both Sides	Existing	Chesapeake Ave	Washington St
8	Piedmont - 2 lane, 35ft 1′ gutter pan	Existing	Piedmont Rd	Leon Sullivan Way, Morris St
9	50′ - two side parking - diagonal one	Existing	California Ave	Quarrier St
10	30′ Cross Section	Existing	Piedmont Rd	Greenbrier St, California Ave
11	Intersection Improvements	Intersection Improvements	Kanawha Blvd	Washington St
12	High-vis Crosswalk	Crossing Improvements	Washington St	Ohio Ave
13	High-vis Crosswalk	Crossing Improvements	Washington St	Crescent Rd
14	High-vis Crosswalk	Crossing Improvements	Washington St	Tennessee Ave
15	Realign Intersection so legs square up	Intersection Improvements	Patrick St	Stockton St
16	Path Connection Under Bridge		Kanawha Blvd W	Elk River
17	Crossing Improvements	Crossing Improvements	Pennsylvania Ave	Kanawha Blvd
18	Crossing Improvements	Crossing Improvements	Tennessee Ave	Kanawha Blvd
19	Intersection Improvements	Intersection Improvements	Delaware Ave	Central Ave
20	Path Connection Under Bridge		Virginia St	Columbia Ave
21	Bike/Ped Cut Through	Bicycle/Pedestrian Cut-Through	57th St SE	Staunton Ave
22	Bike/Ped Bridge Needed	Bicycle/Pedestrian Bridge	Railroad	Kanawha River
23	Intersection Reconfiguration	Intersection Improvements	Pennsylvania Ave	Buchanan St
24	Intersection Improvements	Intersection Improvements	Bigley Ave	Market Dr
25	Intersection Improvements	Intersection Improvements	MacCorkle Ave	Thayer St
26	Trailhead Opportunity	Trailhead Opportunity	Coonskin Dr	Elk River Trail
27	Trailhead Opportunity	Trailhead Opportunity	Kanawha Tpke	Gordon Dr, Spring Dr
28	Crossing Improvements	Crossing Improvements	Castlegate Rd	Gordon Dr
29	Trailhead Opportunity	Trailhead Opportunity	Danner Rd	Kanawha Tpke, Homewood Rd
30	Crossing Improvements	Crossing Improvements	Weberwood Dr	Jophin Branch
31	Bike/Ped Cut-Through	Bicycle/Pedestrian Cut-Through	Stratford Pl	City Limits
32	Intersection Improvements	Intersection Improvements	Hickory Rd	Hwy 119
33	Intersection Improvements	Intersection Improvements	Hodges Rd	Hwy 119